

# NEBOSH International General Certificate in Occupational Safety and Health

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## Element 1: Workplace Hazards & Risk Control.

### Overall aims.

On completion of this [element](#), candidates should be able to demonstrate understanding of the content through the application of knowledge to familiar and unfamiliar situations. In particular they should be able to:

1. Outline common health, welfare and work [environment](#) requirements in the workplace.
2. Explain the risk factors and appropriate controls for [violence](#) at work.
3. Explain the effects of substance misuse on health and [safety](#) at work and [control](#) measures to reduce such risks.
4. Explain the hazards and control measures for safe movement of people in the workplace.
5. Explain the hazards and control measures for safe working at height.
6. Outline the hazards and control measures for temporary works.

### Sources of reference.

- Safety and Health in Construction Convention (C167).
- [ILO](#) Safety and Health in Construction Recommendation (R175).
- ILO Safety and Health in Construction (ILO [Code of Practice](#)).
- ILO Health and Safety in Construction (HSG150), [HSE](#) Books.
- R 102 Welfare Facilities Recommendation, 1956.
- The Workplace (Health, Safety and Welfare) Regulations 1992 ([ACOP](#)) (L24), HSE Books.
- Work at Height Regulations 2005 (amended), A Brief Guide HSE Books.
- [Personal Protective Equipment](#) at Work Regulations 1992.
- The Construction (Design and Management) Regulations 2007).
- The Health and Safety (Safety Signs and Signals) Regulations 1996
- The Provision and Use of Work Equipment Regulations 1998 (as amended)
- The Work at Height Regulations 2005 (as amended).
- The Workplace (Health, Safety and Welfare) Regulations.

### Recommended tuition time.

- Recommended tuition time for this unit is not less than 8 hours.

## 1.0 Health, Welfare and Work Environment Requirements.

In this section of the lesson we will be looking at the requirements for health and welfare provisions.

Welfare and work [environment](#) issues are all covered within The Workplace (Health, [Safety](#) and Welfare) Regulations 1992 as well as the [ILO Hygiene](#) (Commerce and Offices) Recommendation R120.

We will mainly be looking at the following areas:

- Supply of drinking water.
- Washing facilities.
- Sanitary conveniences.
- Accommodation for clothing.
- Rest and eating facilities.
- Seating.
- Ventilation.
- Heating.

- Lighting.

### 1.1 - The Workplace (Health, Safety and Welfare) Regulations 1992.

In the United Kingdom (UK) The Workplace (Health, [Safety](#) and Welfare) Regulations 1992 cover a wide range of basic health, safety and welfare issues and apply to most workplaces (with the exception of those workplaces involving construction work on construction sites, those in or on a ship, or those below ground at a mine).

#### Overview:

The Welfare Regulations were made under Section 15 of the Health and Safety at Work Act and apply to virtually all workplaces - a notable exception being construction sites, although similar requirements are contained in the Construction (Health, Safety and Welfare) Regulations 1996, and farming and forestry land which is away from the main buildings.

#### [Regulation 2:](#)

Of the Welfare Regulations defines a "workplace" as "any premises or part of premises which are not domestic premises and are made available to any person as a place of work". This includes any place on the premises to which a person has access while at work. For example: rooms, lobbies, corridors, staircases, roads or other places used as a means of access or egress from a place of work or where facilities are provided for use in connection with the place of work other than a public road.

The requirements aim to ensure that workplaces meet the health and safety needs of each member of the workforce. Therefore, special consideration may need to be given to the needs of employees with disabilities. For example, several of the regulations require things to be "suitable for any person in respect of whom such things are so done or provided". This emphasises, amongst other matters, that traffic routes, facilities and workstations which are used by persons with disabilities should be suitable for them to use.

#### Regulation 4:

Requires every employer to ensure that every workplace, modification, extension or conversion which is under his or her [control](#), and where any of the employees work, complies with the requirements of the Regulations. Tenant employers are also responsible for ensuring that the workplace complies and that the required facilities are provided. Where facilities, such as sanitary conveniences and washing facilities, are provided by a landlord or a neighbouring business, the employer is still responsible for ensuring that they comply.

### 1.2 - The Workplace (Health, Safety and Welfare) Regulations 1992 (Simply known as The Welfare Regs) cont.

The following table provides a brief outline of the main requirements:

REGULATION	SUBJECT	OUTLINE
5.	<a href="#">Maintenance.</a>	<p><b>Workplaces, equipment, devices and systems to be maintained in:</b></p> <ul style="list-style-type: none"> <li>• An efficient state.</li> <li>• Efficient working order.</li> <li>• Good repair.</li> </ul> <p>Subject to a suitable <a href="#">system</a> of maintenance</p>

		where appropriate. Included in the above are those in which a fault is liable to cause a breach in the Regulations and mechanical ventilation systems provided under Regulation 6.
6.	Ventilation.	Effective and suitable provision to ensure every workplace is ventilated by a sufficient quantity of fresh or purified air. There must be an effective device to give visible or audible warning of failure.
7.	Temperature.	Must be reasonable during working hours. Heating and cooling methods must not result in injurious or offensive fumes. A suitable number of thermometers must be provided for persons to determine the temperature in any workplace. According to the supporting <a href="#">ACoP</a> , the temperature must be at least 16° C unless work involves severe physical effort, when it should be at least 13°C.
8.	Lighting.	<a href="#">Suitable and sufficient</a> lighting in every workplace, so far as is <a href="#">reasonably practicable</a> , by natural <a href="#">light</a> . This must include <a href="#">emergency lighting</a> in any room in which persons at work are especially exposed to danger in the event of failure of artificial lighting. Fire precautions legislation also concerns the lighting of escape routes.
9.	Cleanliness.	Workplaces, furniture and fittings must be kept sufficiently clean. Surfaces of floors, walls, and ceilings must be capable of being kept sufficiently clean. <a href="#">Waste</a> materials must not accumulate, except in suitable receptacles.
10.	Space.	Persons must have sufficient floor area, height and unoccupied space. The ACoP suggests the total volume of the empty room divided by the number of people normally working in it, should be at least 11 cubic metres. (Any height above 3 metres should be taken as 3 metres. The 11 cubic metres per person may be insufficient where much of the room is taken up by furniture, etc.).
11.	Workstations and Seating.	Must be arranged to be suitable for both the person and the work. (Special arrangements are required for outdoor workstations). A suitable seat must be provided where the work can or must be done seated.
12.	Floors and Traffic Routes.	Floors, where necessary, must have an effective means of drainage. They must be kept free from obstruction and substances which could cause slips, trips and falls.  Traffic routes must be constructed to be

		<p>suitable for the purpose.</p> <p>Floors and traffic routes must not have holes, slopes, uneven or slippery surfaces which expose persons to risk.</p>
13.	Falls.	<p>Suitable and effective measures to prevent any person from falling a distance likely to cause <a href="#">personal injury</a> or being struck by a falling object likely to cause <a href="#">personal injury</a>. The measures taken should not, so far as is reasonably <a href="#">practicable</a>, involve <a href="#">personal protective equipment</a> information, <a href="#">training</a> or supervision. (Special arrangements required where falls into dangerous substances could occur.)</p> <p>According to the ACoP, secure fencing should be provided, wherever possible, at any place where a person might fall 2 metres or more.</p>
14.	Windows, etc.	<p>Every window and translucent surface in a wall, partition, door or gate shall, where necessary, be of safety material or be protected against breakages. It must also be appropriately marked or incorporate features to make it apparent.</p>
15.	Windows, Skylights and Ventilators.	<p>Must be capable of being opened. Must not be constructed in a manner which either exposes the person opening or closing them to risk or when open exposes any person to risk.</p> <p>According to the ACoP, they should not project into an area where persons are likely to collide with them.</p>
16.	Cleaning Windows.	<p>Windows must be designed and constructed so as to be cleaned safely. According to the ACoP, where they cannot be cleaned safely from the ground, then suitable provision shall be made for them to be cleaned. This may include using pivot windows which can be cleaned from the inside, fitting access equipment such as cradles or providing suitable conditions for future use of mobile access equipment (anchorage points for securing ladders etc.).</p>
17.	Traffic Routes.	<p>Workplaces must be organised to allow vehicles and pedestrians to circulate safely. Traffic routes must be sufficient in number, suitable for the person and vehicles using them, be in suitable positions and be of sufficient size.</p>
18.	Doors and Gates.	<p>Must be of suitable construction. More detail is given in the Regulations in relation to specific types of doors and gates.</p>
19.	Escalators and Moving	<p>They must function safely, be equipped with</p>

	Walkways.	safety devices and be fitted with one or more emergency stop controls.
20.	Sanitary Conveniences.	<p>Suitable and sufficient conveniences must be provided at readily accessible places.</p> <p><b>The rooms must be:</b></p> <ul style="list-style-type: none"> <li>• Adequately ventilated.</li> <li>• Adequately lit.</li> <li>• Kept clean.</li> </ul> <p>Separate rooms needed for both sexes except where each convenience is in a separate room, capable of being secured from the inside.</p> <p>According to the ACoP, 1 WC is needed for the first 5 employees and another one for every 25 employees above that number. (Where only men are involved, another table gives the number of WCs and urinals to provide).</p>
21.	Washing Facilities.	<p>Suitable and sufficient facilities must be provided. Showers must be provided where required for health reasons. Facilities must be readily accessible and in the immediate vicinity of sanitary conveniences.</p> <p><b>The facilities provided must include:</b></p> <ul style="list-style-type: none"> <li>• A supply of clean hot and cold (or warm) water.</li> <li>• Soap or other means of cleaning.</li> <li>• Towels or other means of drying.</li> </ul> <p>The rooms used must be adequately ventilated, adequately lit and kept clean. Separate facilities being provided for both sexes except in a room intended to be used by one person at a time, whose door can be secured from the inside.</p> <p>The accompanying ACoP suggests that 1 washstation be provided for the first 5 employees and an additional 1 for every 25 employees above that figure.</p>
22.	Drinking Water.	An adequate supply of wholesome drinking water must be provided. Supplies must be readily accessible and conspicuously marked. Suitable cups or drinking vessels must be provided unless a drinking fountain is used.
23.	Storage for Clothing.	Suitable and sufficient accommodation must be provided for non-working clothes and special clothing not taken home. Facilities must be included for drying clothes, so far



		as is reasonably practicable.
24.	Changing Clothes.	Suitable changing facilities must be provided where necessary.
25.	Resting and Eating.  Pregnant Women etc.	Suitable and sufficient and readily accessible facilities must be provided for resting. Suitable facilities to eat must be provided where food eaten in the workplace would otherwise be likely to be contaminated. Suitable and sufficient facilities should be provided where meals are regularly eaten in the workplace.  Suitable facilities shall be provided for any person at work who is a pregnant women or nursing mother to rest.

### 1.3 Health, Welfare & Work Environments International Standards

The requirements for workplace welfare facilities are contained in the [ILO Hygiene \(Commerce and Offices\) Recommendation R120](#).

- **1. This Recommendation applies to all the following establishments, institutions and administrative services, whether public or private:**
  - (a) Trading establishments;
  - (b) Establishments, institutions and administrative services in which the workers are mainly engaged in office work, including offices of persons engaged in the liberal
  - Professions;
  - (c) In so far as they are not included in establishments referred to in Paragraph 2 and are not subject to national laws or regulations or other arrangements concerning hygiene in industry, mines, transport or agriculture, any departments of other establishments, institutions or administrative services in which departments the workers are mainly engaged in commerce or office work.
- **2. This Recommendation also applies to the following establishments, institutions and administrative services:**
  - (a) Establishments, institutions and administrative services providing personal services;
  - (b) Postal and telecommunications services;
  - (c) Newspaper and publishing undertakings;
  - (d) Hotels and boarding houses;
  - (e) Restaurants, clubs, cafés, and other catering establishments;
  - (f) Theatres and places of public entertainment and other recreational services.

#### **ILO [Safety](#) and Health in Construction Convention, 1988 C167.**

This Convention applies to all construction activities, namely building, civil engineering, and erection and dismantling work, including any process, operation or transport on a construction site, from the preparation of the site to the completion of the project.

**Article 32** contains the requirements for welfare facilities on construction sites.

#### **WELFARE.**

- 1. At or within reasonable access of every construction site an adequate supply of wholesome drinking water shall be provided.
- **2. At or within reasonable access of every construction site, the following facilities shall,**

**depending on the number of workers and the duration of the work, be provided and maintained:**

- (a) Sanitary and washing facilities;
  - (b) Facilities for changing and for the storage and drying of clothing;
  - (c) Accommodation for taking meals and for taking shelter during interruption of work due to adverse weather conditions.
- 3. Men and women workers should be provided with separate sanitary and washing facilities.

Also contained in the **ILO Safety and Health in Construction Recommendation R175**.

#### **Welfare:**

- **51.** In appropriate cases, depending on the number of workers, the duration of the work and its location, adequate facilities for obtaining or preparing food and drink at or near a construction site should be provided, if they are not otherwise available.
- **52.** Suitable living accommodation should be made available for the workers at construction sites which are remote from their homes, where adequate transportation between the site and their homes or other suitable living accommodation is not available. Men and women workers should be provided with separate sanitary, washing and sleeping facilities.

We shall now take a closer look at welfare recommendations in the ***ILO Hygiene (Commerce and Offices) Recommendation, R120*** as we have covered the the UK's Workplace (Health, Safety & Welfare) Regulations 1992 in the previous section.

### **1.4 Drinking Water.**

#### **ILO Hygiene (Commerce and Offices) Recommendation R120.**

[http://www.ilo.org/dyn/normlex/en/f?p=1000:55:0::NO::P55\\_TYPE,P55\\_LANG,P55\\_DOCUMENT,P55\\_NO\\_DE:REC,en,R120,%2FDocument](http://www.ilo.org/dyn/normlex/en/f?p=1000:55:0::NO::P55_TYPE,P55_LANG,P55_DOCUMENT,P55_NO_DE:REC,en,R120,%2FDocument).

#### **VIII. Drinking Water.**

- **28.** A sufficient supply of wholesome drinking water or of some other wholesome drink should be made available to workers. Wherever the distribution of running drinking water is practicable, preference should be given to this system.
- **29.**
  - **(1). Any containers used to distribute drinking water or any other authorised drink should:**
    - (a). Be tightly closed and where appropriate fitted with a tap;
    - (b). Be clearly marked as to the nature of their contents;
    - (c). Not be buckets, tubs or other receptacles with a wide open top (with or without a lid) in which it is possible to dip an instrument to draw off liquid;
    - (d). Be kept clean at all times.
  - (2). A sufficient number of drinking vessels should be provided and there should be facilities for washing them with clean water.
  - (3). Cups the use of which is shared by a number of workers should be forbidden.
- **30.**
  - (1). Water which does not come from an officially approved source for the distribution of drinking water should not be distributed as drinking water unless the competent health [authority](#) expressly authorises such distribution and holds periodical inspections.
  - (2) Any method of distribution other than that practised by the officially approved local supply service should be notified to the competent health authority for its approval.



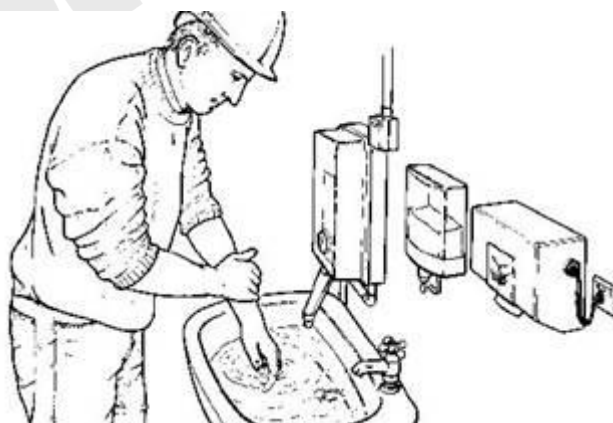
- **31.**
  - (1). Any distribution of water not fit for drinking should be so labelled at the points where it can be drawn off.
  - (2). There should be no inter-connection, open or potential, between drinking water systems and systems of water not fit for drinking.

### 1.5 Supply of Drinking Water Summary

An adequate supply of wholesome drinking water is required, with an upward drinking jet or suitable cups, should be provided. Water should only be provided in refillable enclosed containers where it cannot be obtained directly from a mains supply. The containers should be refilled at least daily (unless they are chilled water dispensers where the containers are returned to the supplier for refilling). Bottled water/water dispensing systems may still be provided as a secondary source of drinking water.

### 1.6 Washing Facilities.

#### IX Washstands and showers.



**Figure 1. Washing Hands.**

- **32.** Sufficient and suitable washing facilities should be provided for the use of workers in suitable places and should be properly maintained.
- **33.**
  - (1). These facilities should, to the greatest possible extent, include washstands, with hot water if necessary, and, where the nature of the work so requires, showers with hot water.
  - (2). Soap should be made available to workers.
  - (3). Appropriate products (such as detergents, special cleansing creams or powders) should be made available to workers wherever the nature of the work so requires; the use for personal cleanliness of products harmful to health should be forbidden.
  - (4). Towels, preferably individual, or other suitable means of drying themselves should be made available to workers. Towels for common use which do not provide a fresh clean portion for each use should be forbidden.
- **34.**
  - (1). Water provided for washstands and showers should not present any health risks.
  - (2). Where water used in washstands and showers is not fit for drinking, this should be clearly indicated.
- **35.** Separate washing facilities should be provided for men and women, except in very small

establishments where common facilities may be provided with the approval of the competent authority.

- **36.** The number of washstands and showers should be fixed by the competent authority having regard to the number of workers and the nature of their work.

### 1.7 Sanitary Conveniences.

#### X Sanitary Conveniences.

- **37.** Sufficient and suitable sanitary conveniences should be provided for the use of workers in suitable places and should be properly maintained.
- **38.**
  - (1) Sanitary conveniences should be so partitioned as to ensure sufficient privacy.
  - (2) As far as possible sanitary conveniences should be supplied with flushing systems and traps and with toilet paper or some other hygienic means of cleaning.
  - (3) Appropriately designed receptacles with lids or other suitable disposal units such as incinerators should be provided in sanitary conveniences for women.
  - (4) As far as possible, conveniently accessible washstands in sufficient number should be provided near conveniences.
- **39.** Separate sanitary conveniences should be provided for men and women, except, with the approval of the competent authority, in establishments where not more than five persons or only members of the employer's family are employed<sup>40</sup>. The number of W.C.'s and urinals for men, and of W.C.'s for women, should be fixed by the competent authority having regard to the number of workers.
- **41.** Sanitary conveniences should be adequately ventilated and so located as to prevent nuisances. They should not communicate directly with workplaces, rest rooms or canteens, but should be separated therefrom by an antechamber or by an open space. Approaches to outdoor conveniences should be roofed.

### 1.8 Sanitary Conveniences & Washing Facilities Summary.

Suitable and sufficient sanitary conveniences and washing facilities should be provided at readily accessible places. They - and the rooms containing them - should be kept clean and be adequately ventilated and lit. Washing facilities should have running hot and cold or warm water, soap and clean towels or other means of cleaning or drying. If required by the type of work, showers should also be provided. Men and women should have separate facilities unless each facility is in a separate room with a lockable door and is for use by only one person at a time.

### 1.9 Accommodation for Clothing.

#### Accommodation for Clothing.

- **45.** Suitable facilities, such as hangers and cupboards, for changing, leaving and drying clothing which is not worn at work should be provided and properly maintained.
- **46.** Where the number of workers and the nature of their work so require, changing rooms should be provided.
- **47.**
  - **(1) Changing rooms should contain:**
    - (a) properly ventilated personal cupboards or other suitable receptacles of sufficient

- dimensions, which can be locked;
    - (b) a sufficient number of seats.
  - (2) Separate compartments for street clothes and working attire should be provided whenever workers are engaged in operations necessitating the wearing of working attire which may be contaminated, heavily soiled, stained or impregnated.

### 1.10 Accommodation for Clothing Summary.

Adequate, suitable and secure space should be provided to store workers' own clothing and special clothing. As far as is reasonably practicable, the facilities should allow for drying clothing. Changing facilities should also be provided for workers who change into special work clothing. The facilities should be readily accessible from workrooms and washing and eating facilities and should ensure the privacy of the user.

### 1.11 Rest & Eating Facilities.

#### XVIII. Mess rooms.

- **66.** In cases to be determined by the competent authority, mess rooms should be provided for workers.
- **67.**
  - (1). Mess rooms should be provided with sufficient seats and tables.
  - (2). Within or in the immediate vicinity of mess rooms arrangements for heating meals, cool drinking water and hot water should be available.
  - (3). Covered waste bins should be provided.
- **68.**
  - (1). Mess rooms should be separate from any place in which there is exposure to [toxic](#) substances.
  - (2). The wearing of contaminated work clothing in mess rooms should be forbidden.

### 1.12 Further Details - Rest and Eating Facilities.

Suitable and sufficient, readily accessible rest facilities should be provided. Rest areas or rooms should be large enough, and have sufficient seats with backrests and tables, for the number of workers likely to use them at any time. They should include suitable facilities to eat meals where meals are regularly eaten in the workplace and where the food would otherwise be likely to become contaminated.

Seats should be provided for workers to use during breaks. These should be in a place where personal protective equipment need not be worn. Work areas can be counted as rest areas and as eating facilities, provided they are adequately clean and there is a suitable surface on which to place food. Where provided, eating facilities should include a facility for preparing or obtaining a hot drink. Where hot food cannot be obtained in, or reasonably near to, the workplace, workers may need to be provided with a means for heating their own food.

Canteens or restaurants may be used as rest facilities provided there is no obligation to purchase food.

Suitable rest facilities should be provided for pregnant women and nursing mothers. They should be near to sanitary facilities and, where necessary, include the facility to lie down.

### 1.13 Seating.

#### XIX. Rest rooms.

- **69.**
  - (1). Where alternative facilities are not available for workers to take temporary rest during working hours, a rest room should be provided, where this is desirable, having regard to the nature of the work and any other relevant conditions and circumstances. In particular, rest rooms should be provided to meet the needs of women workers; of workers engaged on particularly arduous or special work requiring temporary rest during working hours; or of workers employed on broken shifts.
  - (2). National laws or regulations should, where appropriate, empower the competent authority to require the provision of rest rooms in cases in which this is considered desirable by the competent authority owing to the conditions and circumstances of employment.
- **70. The facilities so provided should include at least:**
  - (a). A room in which provision suited to the climate is made for relieving discomfort from cold or heat;
  - (b). Adequate ventilation and lighting;
  - (c). Suitable seating facilities in sufficient numbers.

### 1.14 Seating Summary.

Workstations should be suitable for the people using them and for the work undertaken at them. People should be able to leave workstations swiftly in an emergency. If work can or must be done sitting, seats which are suitable for the people using them and for the work undertaken at them should be provided. Seating should give adequate support for the lower back, and footrests should be provided for workers who cannot place their feet flat on the floor.

### 1.15 Ventilation.

#### IV. Ventilation.

- **11.** In all places in which work is carried on, or which contain sanitary or other facilities for the common use of workers, there should be sufficient and suitable ventilation, natural or artificial or both, supplying fresh or purified air.
- **12. In particular:**
  - (a). Apparatus ensuring natural or artificial ventilation should be so designed as to introduce a sufficient quantity of fresh or purified air per person and per hour into an area, taking into account the nature and conditions of the work;
  - (b). Arrangements should be made to remove or make harmless, as far as possible, fumes, dust and any other obnoxious or harmful impurities which may be generated in the course of work;
  - (c). The normal speed of movement of air at fixed work-stations should not be harmful to the health or comfort of the persons working there;
  - (d). As far as possible and in so far as conditions require, appropriate measures should be taken to ensure that in enclosed premises a suitable hygrometric level in the air is maintained.
- **13.** Where a workplace is wholly or substantially air conditioned, suitable means of emergency ventilation, natural or artificial, should be provided.

### 1.16 Ventilation Summary.

Workplaces need to be adequately ventilated. Fresh, clean air should be drawn from a source outside the workplace, uncontaminated by discharges from *flues*, *chimneys* or other *process outlets*, and be circulated through the workrooms.

Ventilation should also remove and dilute warm, humid air and provide air movement which gives a sense of freshness without causing a draught. If the workplace contains process or heating equipment or other sources of *dust*, *fumes* or *vapours*, more fresh air will be needed to provide adequate ventilation.

Windows or other openings may provide sufficient ventilation but, where necessary, mechanical ventilation systems should be provided and regularly maintained.

These regulations do not prevent the use of unflued heating systems designed and installed to be used without a conventional flue.

### 1.17 Lighting.

#### V. Lighting.

- **14.** In all places in which work is carried on, or through which workers may have to pass or which contain sanitary or other facilities provided for the common use of workers, there should be, as long as the places are likely to be used, sufficient and suitable lighting, natural or artificial, or both.
- **15. In particular, all practicable measures should be taken:**
  - **(a). To ensure visual comfort:**
    - (i). By openings for natural lighting which are appropriately distributed and of sufficient size;
    - (ii). By a careful choice and appropriate distribution of artificial lighting;
    - (iii). By a careful choice of colours for the premises and their equipment;
  - (b). To prevent discomfort or disorders caused by glare, excessive contrasts between light and shade, reflection of light and over-strong direct lighting;
  - (c). To eliminate harmful flickering whenever artificial lighting is used.
- **16.** Wherever sufficient natural lighting is reasonably practicable it should be adopted in preference to any other.

### 1.18 Lighting Summary.

Lighting should be sufficient to enable people to work and move about safely. If necessary, local lighting should be provided at individual workstations, and at places of particular risk such as crossing points on traffic routes. Lighting and light fittings should not create any hazard.

Automatic emergency lighting, powered by an independent source, should be provided where sudden loss of light would create a risk.

### 1.19 Heat & Radiation.

In this section, we will look at the effects of exposure to extremes of temperature (hot & cold) and the preventive measures.



## Heat.

Heat can be more than uncomfortable. It can be dangerous and even deadly. Summer weather is a common cause of heat problems. Workers are also exposed to heat in boiler rooms, laundry facilities, confined spaces, and during welding or brazing. Too much heat can cause a number of health problems.

## Health Effects.

**Being exposed to heat can cause the following problems:**

- Heat rash is also known as prickly heat.
- Heat cramps are painful muscle spasms. The cramps usually are felt in the arms, legs and stomach area. They usually occur after sweating heavily and not drinking enough liquids.
- Heat exhaustion symptoms include tiredness, dizziness, clammy skin, heavy sweating, loss of appetite, nausea and pain in the stomach area. These symptoms are brought on when the body loses too much fluid (dehydration) during hard physical labour.
- Heat stroke occurs when the body can no longer cool itself. The person's skin becomes hot and red or blotchy, and their body temperature is as high as 41 degrees or more. Heat stroke can cause a person to lose consciousness and go into a coma. Heat Stroke can kill. Heat stroke is a condition that needs immediate medical attention.
- Other effects of exposure include heart disease. Workers also become less alert and are more likely to injure themselves or others.

## 1.20 Exposure to Extremes of Temperature.

### VI. Temperature.

- **19.** In all places in which work is carried on, or through which workers may have to pass, or which contain sanitary or other facilities provided for the common use of workers, the best possible conditions of temperature, humidity and movement of air should be maintained, having regard to the nature of work and the climate.
- **20.** No worker should be required to work regularly in an extreme temperature. Accordingly, the competent authority should determine either maximum or minimum standards of temperature, or both, having regard to the climate and to the nature of the establishment, institution or administrative service and of the work.
- **21.** No worker should be required to work regularly in conditions involving sudden variations in temperature which are considered by the competent authority to be harmful to health.
- **22.**
  - (1). No worker should be required to work regularly in the immediate neighbourhood of equipment radiating a large amount of heat or causing an intense cooling of the surrounding air, considered by the competent authority to be harmful to health, unless suitable control measures are taken, the time of the worker's exposure is reduced, or he is provided with suitable protective equipment or clothing.
  - (2). Fixed or movable screens, deflectors or other suitable devices should be provided and used to protect workers against any large-scale intake of cold or heat, including the heat of the sun.
- **23.**
  - (1). No worker should be required to work at an outdoor sales counter in low temperatures likely to be harmful unless suitable means of warming himself are available.
  - (2). No worker should be required to work at an outdoor sales counter in high temperatures likely to be harmful unless suitable means of protection against such high temperatures are available.



### 1.21 Measuring Heat Hazards.

Knowing the temperature is only part of figuring out if it is too hot. The effects of heat increase when it is humid, or when there is no breeze. A [Wet Bulb Globe Temperature](#) device gives a reading based on heat, humidity and wind speed, and provides a more accurate measure of the effects of heat on the body.



Figure 1.

### 1.22 Controlling Heat Hazards.

#### Engineering Controls.

##### Ventilation and air conditioning:

Air conditioning can eliminate heat hazards in buildings and vehicles. Areas with machines such as ovens, dryers and other equipment that cause heat need exhaust systems to remove the extra heat that is produced.

##### Work Practices (Administrative Controls).

The following changes can protect workers from heat:

- **Scheduling:** Do the hottest work during early morning, evening or night hours, or on cooler days.
- **Job rotation:** Divide heavy and hot work among more workers.
- **Breaks:** Take breaks, preferably in an air-conditioned area or at least a shady place.
- **Drink fluids:** Replace the fluids that are lost through sweating. **AVOID DRINKS THAT CONTAIN CAFFEINE AND ALCOHOL** as these make you lose more fluids.
- **Get used to heat gradually:** Workers need a chance to get used to heat (acclimatisation). At first, work in hot environments should be limited to short periods. The amount of time that workers spend in the heat should be increased gradually.

##### Personal Protective Equipment.

Light-coloured clothing should be worn. Cooling vests provide some protection for jobs like highway repair and working on boilers and in steam tunnels.

### 1.23 Cold Hazards.

Working in cold areas can be just as hazardous as working in hot environments and some of the health effects are described below.

Health Effects from exposure to the cold include:

- **Frostbite:** As the body tries to prevent heat loss, less blood reaches the surface. Hands and feet become numb and the skin freezes. Severe frostbite may require amputation of the affected parts.
- **Hypothermia:** This is a condition that results from being in cold weather or submerged in cold water. The body can no longer create heat, causing dizziness, fatigue and can lead to unconsciousness and death.
- **Trench foot:** Long periods of exposure to wet and cold conditions can cause severe nerve and muscle [damage](#) in the feet.
- **Eye injuries:** Workers can become snowblind and the cold can cause the cornea to freeze.

### 1.24 Controlling Cold Hazards.

The following steps can protect workers from the cold:

- Give workers frequent rest periods in a warm area.
- Provide clothing designed to keep cold and wind out and allow heat and perspiration to escape. The body loses heat quickly when clothes are wet.
- Workers should wear layers of vented clothing and insulated gloves and footwear.
- Where possible, build barriers around the work site to block the wind.
- Supply workers with warm beverages that do not contain caffeine or alcohol.
- Keep vehicles in good running order. Workers can be exposed to extreme cold for long periods if they get stranded in vehicles that break down.

### 1.25 Heating Assessment.

The risk to the health of workers increases as conditions move further away from those generally accepted as comfortable. Risk of [heat stress](#) arises - for example - from working in high air temperatures, exposure to high thermal [radiation](#) or high levels of humidity, such as are found in foundries, glass works and laundries. [Cold stress](#) may arise for example, from working in refrigeration units, food preparation areas and in the open air during winter.

Assessment of the risk to workers' health from working in either a hot or cold [environment](#) needs to consider two sets of factors: personal, and environmental. Personal factors include body activity, the amount and type of clothing, and duration of exposure. Environmental factors include ambient

temperature and radiant heat and if the work is outside, sunlight, wind velocity and the presence of rain or snow.

**Any assessment needs to consider:**

- Measures to control the workplace environment, in particular heat from any source. Minimising the risk of heat stress may mean insulating plant which acts as a source of radiant heat, using local cooling by increasing ventilation rates and maintaining the appropriate level of humidity. If it is not reasonably practicable to avoid workers being exposed to cold environments, you should consider using local environmental controls for example, cab heaters in fork-lift trucks used in cold stores.
- Restriction of exposure by, for example, re-organising tasks to build in rest periods or other breaks from work. This will allow workers to rest in an area where the environment is comfortable and, if necessary, to replace bodily fluids to combat dehydration or cold. If work rates cause sweating, workers may need frequent rest pauses for changing into dry clothing.
- Medical pre-selection of employees to ensure that they are fit to work in these environments.
- Use of suitable clothing (which may need to be heat resistant or insulating, depending on whether the risk is from heat or cold)
- Acclimatisation of workers to the environment in which they work.
- Training in the precautions to be taken.
- Supervision to ensure that the precautions identified by the assessment are taken.

## **2.0 - Violence at Work.**

According to a UK [crime survey](#) of [violence](#) at work, workers in the protective services, for example police officers, are most at risk of violence at work. 14% of workers in this area have experienced violence. Health and social welfare associated professionals, including nurses, medical and dental practitioners are also at relatively high risk: 5% experienced violence.

The [Health and Safety Executive \(HSE\)](#) defines work-related violence as:

*"Any [incident](#) in which a person is abused, threatened or assaulted in circumstances relating to their work"*

This can include verbal abuse or threats as well as physical attacks.

### **ILO Definition of Workplace Violence.**

#### **1.3.1. Workplace violence.**

Any action, incident or [behaviour](#) that departs from reasonable conduct in which a person is assaulted, threatened, harmed, injured in the course of, or as a direct result of, his or her work.

- Internal workplace violence is that which takes place between workers, including managers and supervisors.
- External workplace violence is that which takes place between workers (and managers and supervisors) and any other person present at the workplace.

#### **ILO [Code of practice](#) on workplace violence.**

[http://www.ilo.org/wcmsp5/groups/public/@ed\\_protect/@protrav/@safework/documents/normativeinstrument](http://www.ilo.org/wcmsp5/groups/public/@ed_protect/@protrav/@safework/documents/normativeinstrument)

## **2.1 - Identify the Conditions that Increase the Chances of Violence (Risk Factors).**

Identifying risk factors involves looking at the work environment, work practices and victim and perpetrator characteristics.

### **Environmental risk factors that predict violence include:**

- A violent society.
- A violence-prone neighbourhood.
- The large number of weapons in circulation.
- Early release of mental patients who have a history of violence.
- Hospitalisation instead of incarceration of violent criminals.

### **Work practices associated with workplace violence include:**

- Low staffing levels.
- Working alone.
- Working late at night or early in the morning.
- Working with money or prescription drugs.
- Long waits for services by customers, clients or patients.
- The lack of available services.

### **Victim characteristics include:**

- Working in homes or in the community.
- Handling money or prescription drugs.
- Working in correctional institutions or institutions for the mentally ill or developmentally-disabled without adequate training in violence-avoidance or self-defence.
- Providing care, advice or information, such as health care workers, mental health workers, emergency-room and admission workers, and social services workers.
- Dealing with complaints, such as social service, child welfare and unemployment workers.
- Having the authority to act against the public, inspect premises and enforce laws, such as inspectors, child welfare workers, law enforcement/corrections officers and security guards.

### **Characteristics of those who commit violence (perpetrator characteristics) include:**

- Persons with a history of violent behaviour.
- Criminal gang members.
- Relatives of injured persons.
- Drug/alcohol abusers.

## **2.2 - Violence at Work - Control Measures.**

### **Eliminate or Reduce Risks.**

As with other health and safety problems, first try to eliminate the problem. If this is not possible, then attempt to engineer or build the problem out of the workplace. Finally, change administrative procedures.

### **Try to remove the problem.**

Mental health and social service workers are frequently assaulted by patients or residents in health care

or social service facilities; these are patients or residents who should be in jails or forensic facilities.

**Engineering controls that can provide protection:**

- Metal detectors (stationary or hand-held);
- Changing office design to provide escape routes for employees;
- Panic alarms;
- Bullet-proof glass;
- Entrance controls in certain parts of the building;
- Closed-circuit TV cameras;
- Restricting entrance to a facility after dark;
- Mobile phones for field personnel.

**Administrative controls that can reduce risks:**

- Additional staffing;
- A ban on working alone;
- Recording accidents, verbal abuse and near-misses;
- Training in diffusing violent situations or in self-defence.

**Post-Incident Procedures.**

**NOTE:** Training as the sole safety programme [element](#) will create an impossible responsibility on the worker for safety and security for him or herself, colleagues or other clients. Other programme elements must always accompany training.

Persons trained to treat people exposed to violent incidents should be called in immediately after an incident has taken place. Procedures such as critical incident debriefing and sometimes long-term counselling may be appropriate not just for victims of assaults, but also for witnesses or people doing similar jobs.

### 2.3 - Worker-on-Worker Violence.

Assaults or threats by one worker on another are very difficult issues to resolve.

It is important to attempt to discover the cause of a worker's threatening behaviour.

**Possible causes are:**

- A *"toxic workplace"* (high stress levels, abusive management, threatened layoffs, etc.);
- Drug or alcohol abuse;
- Domestic problems (relationship, money, etc.);
- Mental health problems.

Seek the help of a professional when there is a real risk of violence. Managers should not try to address potentially violent situations themselves.

It is useful to attempt to resolve these problems before the discipline and grievance process starts. Discipline and grievance procedures lead to winners and losers. The solution lies in getting help for the troubled worker, if possible. **Employee Assistance Programs (EAPs)** can often be useful.

### 2.4 Workplace Violence Policies.

Every workplace should have a workplace violence [policy](#) that contains a management statement that violence or threatening behaviour will not be tolerated, whether it comes from clients, customers, patients, inmates, colleagues or supervisors.

**What to [watch](#) out for:**

- **Profiles:** The media and many consultants promote the use of profiles that put workers into categories that allegedly measure the [likelihood](#) that they will become violent. These profiles are not very accurate and can be used by management to discriminate against employees.
- **Zero-Tolerance Policies:** These call for the immediate termination of anyone violating the anti-violence policy. These often lack flexibility and can make workers reluctant to report incidents because they may feel that a colleague will be fired instead of helped.
  - Policies that do not apply to management.
  - Policies that create committees that do not consult widely enough.
  - Policies that violate employees' contractual rights

**Free leaflets.**

**A range of free leaflets providing advice and guidance:**

- **Don't mix it:** A guide for employers on alcohol.
- **Drug misuse at work:** A guide for employers.

**HSE and alcohol and drugs:**

- Alcohol misuse.
- Key messages and information about responsibilities in relation to health and safety law.
- Drugs and other substance misuse.
- Key messages and information about responsibilities in relation to health and safety law.
- Smoking.

### 3.0 - Substance Misuse at Work.

It is generally agreed that substance abuse, and its effects, is an increasing global concern that demands attention from all spheres of society and industry. Therefore, recognising the potentially serious impact of incidents to all businesses and employees and to promote healthy and safe operations and the protection of the environment is of paramount importance.

**Definitions.**

Substances of abuse include alcohol and illicit drugs. In addition, inappropriate use of prescription and "over the counter" medicines, or other substances, may result in impairment to health, behaviour, judgement or job performance.

**Abuse** is the incorrect, improper or harmful use of any substance in such a way as intentionally to modify mood, behaviour or performance. It does not include the appropriate use of therapeutic medication as directed by a doctor/physician. It includes use which can be described as dependency, [habituation](#) or addiction.

**Impairment** is the alteration of normal physical or mental function which results in diminished ability to perform assigned tasks in a safe and productive manner.

**Dependence** is a condition in which an individual has lost control over the use of the substance in question. Even after realising the negative effect, the person has an increased need to use it and is



unable to stop despite attempts to cut down or quit. Dependence can lead to addiction, in which the individual is physically and mentally unable to conduct their lives without the substance.

### **Policy.**

A substance abuse policy is a pre-requisite to the management of this problem in the workplace. Such a policy must take into account relevant national legislative and socio-cultural aspects (e.g. use of alcohol, and marijuana).

- Rules at work should be established and a system should be in place to provide awareness, monitoring, testing and rehabilitation.
- The objective of the policy should be to prevent any of the workforce becoming a risk to themselves or others by the abuse of substances.

### **Rules at work.**

Key elements of a substance abuse policy should be the setting of clear rules regarding fitness for work, and the availability, possession and use of substances of abuse at company premises or on company business.

### **Alcohol.**

The possession, distribution, consumption or sale of alcohol at company premises or on company business should not be permitted without prior management approval and control.

### **Other substances of abuse.**

The use, possession, distribution or sale of illegal drugs should be strictly prohibited. This prohibition should also apply to the abuse of legal drugs or other substances.

### **Prescription and over-the-counter medication.**

The normal use of prescription or over-the-counter medication can impair performance.

Employees, visitors and contractors, who use medication that may impair performance should seek advice from a health professional. Where appropriate, they should notify their direct superior, who will then determine whether specific measures need to be taken in order to reduce risks.

## **3.1 - Risks to Health and Safety from Alcohol and Drugs at Work.**

### **Alcohol-related absenteeism and sickness absence.**

Alcohol is estimated to cause 3-5% of all absences from work; about *eight to 14 million lost working days* in the UK each year.

### **The effects of drinking on productivity and safety.**

Alcohol consumption may result in reduced work performance, damaged customer relations, and resentment among employees who have to 'carry' colleagues whose work declines because of their drinking. There are no precise figures on the number of workplace accidents where alcohol is a factor, but alcohol is known to affect judgement and physical co-ordination. Drinking even small amounts of alcohol before or while carrying out work that is 'safety sensitive' will increase the risk of an [accident](#).

Contrary to popular belief, the majority of people who have a drinking problem are in work. The good news is that people with drink problems can, and do, cut down and that there are places throughout the country where people with drinking problems can go for expert help.

The prospect of tackling when and how much employees drink can be daunting, especially for businesses without a personnel specialist. However, acting to prevent problems before they occur can save time, often eventually proving more effective than dealing with a problem that has become too serious to ignore. The workplace risks for drug abuse are similar to those mentioned for alcohol.

### 3.2 - Employment Practices.

Work activities or conditions may contribute to alcohol problems (e.g. company organised or promoted functions); these should be identified and appropriate preventative or remedial actions taken.

Behaviour that incites, encourages or otherwise facilitates abuse of substances should not be supported by management.

Information, [education](#) and training.

Information, education and training programmes concerning substance abuse should be undertaken to promote safety, and abuse could result in the invoking of disciplinary procedures, up to and including [dismissal](#).

#### **Alcohol testing.**

The recommended testing method for alcohol use is the measurement of breath alcohol concentration. This is a non-invasive and relatively simple method, which can be used in most locations and operating conditions. Confirmatory blood alcohol testing is usually not required for properly performed breath analysis when checking compliance with a company maximum allowable breath alcohol concentration. However, it may be needed for legal or other reasons.

#### **Drug testing.**

The testing for drugs involves the analysis of urine or other body samples (saliva, hair). This requires a system which incorporates a [chain](#) of custody and analysis procedures and a defined [role](#) for the company's designated medical representative (Medical [Review](#) Officer) which guarantees sample and result validity and confidentiality.

A physician with knowledge of substance abuse, the Medical Review Officer, can interpret the laboratory result and advise the company of its significance. Interpretation of a confirmed positive drug test by the physician must be based on medical interview, a review of the employee's medical history and records, and a review of any other relevant biomedical factors. If the employee has a legitimate medical explanation for a confirmed positive test, the physician must report that test to the employer as negative.

In recent years, onsite testing kits have come into use. These have certain drawbacks including lack of confidentiality, requirement for consent of employee to be tested, lack of intervention of Medical Review Officer, false positives, and the need for a confirmatory test in an approved laboratory. The [quality](#) of the onsite test kits is likely to improve over time, but these are not considered to be the best option for testing at present.

**Consideration should be given to testing for substance abuse under the following circumstances:**

- Pre-employment testing of all applicants.
- **For cause testing at management discretion:** post-incident, substances found on site, suspected substance abuse, behaviour hazardous to personnel, operations or environment.
- **Random testing:** Random testing is a method of auditing compliance with the substance abuse policy. Random testing may be most appropriately applied to designated risk-sensitive positions.
- Testing should apply equally to all personnel in risk-sensitive positions, both employees and others.

#### **Rehabilitation.**

Company policies should recognise that substance dependency can be a treatable medical condition, provided that the individual fully co-operates. Employees with a declared substance dependency problem should be dealt with in the same way as any other employee with a medical condition. The policy should provide for rehabilitation and return to effective work upon a medical evaluation of the individual's

capabilities following treatment.

Any employee under rehabilitation should be subject to unannounced testing as part of their after-care programme. Each company should decide how they will manage the occurrence of relapses.

### 3.3 - Control Measures to Reduce Risks from Substance Misuse.

**A model workplace alcohol policy would cover the following areas.**

**Aims.**

Why have a policy?

To whom does the policy apply?

(Note: best practice would be for the policy to apply equally to all grades of staff and types of work.)

**Responsibility.**

Who is responsible for implementing the policy?

(Note: all managers and supervisors will be responsible in some way but it will be more effective if a senior employee is named as having overall responsibility.)

**The rules.**

How does the company expect employees to behave to ensure that their alcohol consumption does not have a detrimental effect on their work?

**Special circumstances.**

Do the rules apply in all situations or are there exceptions?

**Confidentiality.**

A statement assuring employees that any alcohol problem will be treated in strict confidence.

**Help.**

A description of the support available to employees who have problems because of their drinking.  
Information.

A commitment to providing employees with general information about the effects of drinking alcohol on health and safety.

**Disciplinary action.**

The circumstances in which disciplinary action will be taken.

**Alcohol and Drugs Policy.**

ILO Code of practice on alcohol and drugs in the workplace.

[http://www.ilo.org/wcmsp5/groups/public/@ed\\_protect/@protrav/@safework/documents/normativeinstrument/wcms\\_107799.pdf](http://www.ilo.org/wcmsp5/groups/public/@ed_protect/@protrav/@safework/documents/normativeinstrument/wcms_107799.pdf)

### 3.2. Contents of an alcohol and drug policy.

**3.2.1. A policy for the management of alcohol and drugs in the workplace should include information and procedures on:**

- (a). Measures to reduce alcohol- and drug-related problems in the workplace through proper personnel management, good employment practices, improved working conditions, proper arrangement of work, and consultation between management and workers and their representatives;
- (b). Measures to prohibit or restrict the availability of alcohol and drugs in the workplace;

- (c). Prevention of alcohol- and drug-related problems in the workplace through information, education, training and any other relevant programmes;
- (d). Identification, assessment and referral of those who have alcohol- or drug-related problems;
- (e). Measures relating to intervention and treatment and rehabilitation of individuals with alcohol- or drug-related problems;
- (f). Rules governing conduct in the workplace relating to alcohol and drugs, the violation of which could result in the invoking of disciplinary procedures up to and including
- Dismissal;
- (g). Equal opportunities for persons who have, or who have previously had, alcohol- and drug-related problems, in accordance with national laws and regulations.

### 3.4 - Alcohol and Drugs at Work Additional Information.

The following is a video taken from our diploma course which will also be beneficial to this course in regards alcohol and drug abuse.

Video missing

#### **Free leaflets.**

A range of free leaflets providing advice and guidance.

- [Don't mix it - a guide for employers on alcohol.](#)
- [Drug misuse at work: a guide for employers \[600kb\].](#)

#### **HSE and alcohol and drugs**

- [Alcohol misuse.](#)  
Key messages and information about responsibilities in relation to health and safety law.
- [Drugs and other substance misuse.](#)  
Key messages and information about responsibilities in relation to health and safety law.
- [Smoking.](#)

### 4.0 - Safe Movement of People in the Workplace.

Traffic and pedestrian movement at workplaces should be:

- Designed.
- Planned.
- Controlled.

So, it can circulate without risks to health and safety.

### 4.1 Conditions & Environments in Which Each Hazard May Arise.

Conditions and environments that promote hazards include:

- Staircases.

- [Maintenance](#) work.
- Changes in level
- Crossing transport routes

## 4.2 Hazards Related to the Movement of People in the Workplace.

Hazards to pedestrians.

### Typical hazards causing:

- Slips, trips and falls on the same level;
- Falls from a height;
- Collisions with moving vehicles;
- Striking by moving, flying or falling objects;
- Striking against fixed or stationary objects; and
- Conditions and environments in which each [hazard](#) may arise.

## 4.3 Pedestrians - Slips, Trips & Falls.

The majority of slips, trips and falls tend to be on the same level and can result in bruising, fractures and broken bones as well as blows to the head resulting in concussion.

Over a third of all major injuries reported each year are caused as a result of a slip or trip. This is the single most common cause of workplace injuries.

The cost to employers is high. On average in the UK, £300 million is lost per annum due to lost production and other associated costs.

### Slips, trips and falls tend to be high in certain industries, for example:

- **Food industry:** Accidents caused due to regular cleaning of floors and work surfaces which are left wet as a consequence.
- **Engineering industry:** Due to spillages of oil and other lubricants on to the floor.
- **Plastics Industry:** Where plastic granules on the floor increase the risk of slips and trips.

All of the above can be avoided by general good housekeeping practices. Spillages should be cleaned up quickly and where the liquid is oil or a similar lubricant, absorbent materials should be used.

You will often see a bag of sand or cat litter in the corner of your local garage, for such incidents.

### Slip hazards can be caused by:

- Loose floor coverings on slippery floor surfaces.
- Wet or dusty floors.
- Spillages of either wet or dry substances, i.e. water, oil, [dust](#).
- Wet or icy weather conditions.
- Unsuitable footwear.
- Uneven flooring.

#### **Trip hazards tend to be caused by:**

- Worn and threadbare floor coverings, including mats and rugs.
- Poor housekeeping, including obstacles or rubbish left in walkways.
- Obstructions such as protruding walls or low ceilings or beams.
- Cables or trailing electric/telephone wires.
- Raised floor sockets for electrical appliances.
- Poor or faulty lighting levels.
- Unsuitable footwear with slippery soles, untied laces or lack of adequate ankle support.

#### **4.4 Control Measures for Slips, Trips & Falls on the Same Level.**

These can be avoided or at least reduced by the implementation of various [control](#) measures following a suitable [risk assessment](#):

- No obstacles in the walkway.
- Non-slip flooring.
- Level walkways.
- Marked walkways.
- Good lighting.
- Spillage control.
- Guarding and fencing off designated areas.
- Appropriate footwear.
- Information, instruction, supervision and [training](#).

#### **4.5 Falls from a Height.**

The construction industry tends to have the most accidents as a result of falls from height. These accidents are usually associated with falls from a greater heights. The resulting injuries tend to be fractured bones, head injuries and [loss](#) of consciousness and can lead to loss of life.

Falling down staircases, off landings, roofs, stepladders and mobile access platforms all come within this category.

Other shorter falls in height can include falling off steps and chairs.

#### **4.6 Control Measures for Falls from a Height.**

Measures should be taken, as far as is [reasonably practicable](#), to prevent any person falling from a height that is likely to cause [personal injury](#) or to be struck by a falling object that is likely to cause [injury](#).

Using suitable guardrails and barriers and applying the hierarchy of controls will reduce the risk.

Wherever possible, remove the possibility of falling by undertaking the work at ground level.

Where this is not possible, protect the individuals from the hazard by installing suitable guard and hand rails, fencing, toe boards, working platforms, ladder hoops, etc. Fencing should be of adequate height and strength to prevent people or objects from falling over.



Safety harnesses, as with all [Personal Protective Equipment \(PPE\)](#), should only be used when all other possibilities have been exhausted.

Stairways are a particular problem area. The provision of handrails and banisters on open sides of stairways will help prevent people from falling.

**Careful consideration of the following design features will help to reduce the risk of accidents:**

- Width of the stairway, depth of the tread and provision of landings, handrails and banisters.
- Non-slip surfaces or floor coverings.
- Reflective edges on stairs.
- Adequate lighting, including [emergency lighting](#).
- Maintenance and housekeeping.
- Alternative provision such as a lift for persons with disabilities.

Ladders are designed for transient access and not as a permanent fixture. It is not reasonably [practicable](#) to expect an employee to carry out their work all day from a ladder. Consideration should be given to other equipment, such as Mobile Elevated Working Platforms (Cherry Pickers). However, training and instruction should be given to employees before using this type of equipment.

Where goods or equipment have to be transferred from an open edge or to a higher or lower level, secure handrails should be installed, sufficient to bear the weight of an individual and positioned at such an angle that the person is not having to over stretch and risk falling. Covers should be installed other than when this activity is taking place, and should be replaced immediately when this aspect of work has been completed.

Roof work also has a high risk factor and is responsible for the majority of fatal falls from height each year. Many of these are as a result of falling through a fragile roof or skylight.

Work to be carried out on a roof should only be done by experienced and trained personnel, as it is a specialist area. Detailed risk assessments should be carried out, paying particular attention to access and egress, work platforms, edge protection, equipment to be used and prevention of risks of falling items. Weather conditions should also be considered.

#### **4.7 - Collisions with Vehicles.**

The UK Workplace [Regulation](#) 17 states that every workplace shall be organised so that vehicles and pedestrians can move safely.

Workplace Transport refers to any vehicle or piece of mobile equipment, which is used by employers, employees, self-employed people or visitors in any workplace.

Workplace transport is the second biggest cause of fatal accidents in the workplace and all industries are affected by this.

Accidents as a result of a pedestrian colliding with a vehicle can take place at the work place, either within the premises or on access roads to and from the site or around buildings. Invariably, these accidents have more serious consequences.

There are particular problems where there is no defined separation between access and egress for both

pedestrians and vehicles.

**Other factors may include:**

- Blind corners.
- Poor lighting.
- Lack of warning signs and audible alarms.

**Potential causes of accidents can be due to:**

- The driver - inadequate training, instruction and supervision.
- The vehicle - poor maintenance.
- The [System](#) of Work - inadequate risk assessments.

**Types of accidents can be due to:**

- Forward motion.
- Reversing.
- Overturning.

**Other hazards associated with vehicles include:**

- [High pressure](#) fluid injection.
- [Ergonomics](#).
- Puncture and injection.
- Biological.
- Cutting and severing.
- Fire and [explosion](#).
- Electricity.
- Crushing.
- [Vibration](#).
- Impact.
- [Noise](#).

Many different types of vehicles are used in the workplace, from forklift trucks to dumper trucks and heavy goods vehicles.

A key factor in many accidents is the lack of [competence](#) and driver training.

**Common accidents are:**

- Vehicles overturning due to being driven at speed;
- A [load](#) incorrectly balanced;
- Driving into excavations; and
- Runaway vehicles which have been left with the engine running, whilst unattended.

Employers should only allow trained and designated personnel to operate transport vehicles and firm disciplinary action should be taken against unauthorised use of work transport equipment.

It is recommended that the training provided is accredited by a recognised body and that refresher training is given to all drivers at regular intervals and with the introduction of new vehicles and equipment.

Regulation 3 of the UK Management of Health and Safety at Work 1999 requires that employers assess the risks to workers and anyone else, for example members of the public, who may be affected by the

activities being undertaken.

These requirements apply to all work activities, including those involving transport, e.g. driving, loading, sheeting and maintenance.

**These risks can be identified, for example by asking the following:**

- Is there a danger of people being struck or run over by moving vehicles, and what is the cause?
- Is there a danger of people falling from vehicles, for example, while gaining access or alighting from them or while involved in loading/unloading or other activities, and what is the cause?
- Is there danger of being struck by an object falling from a vehicle, and what is the cause?
- Is there a danger of the overturning, and what is the cause?

**In looking for the hazards, areas to examine should include:**

- The vehicle themselves. Are they safe and suitable for the work for which they are being used? Are they properly maintained? Do the vehicles need to be replaced with new, safer vehicles?
- The routes or roadways used by the vehicles. Are they safe and suitable for the type and number of vehicles using them? Has account been taken of nearby hazards and obstructions?
- The action of the drivers. Have they been trained and deemed competent? Are they using safe working practices?
- The activities of others in the vicinity of the vehicle; contractors, members of the public, visiting drivers, etc.

#### **4.8 Segregation of Vehicles & Pedestrians.**

Wherever possible, the ideal solution is to separate vehicles and pedestrians.

**The recognised systems for separation are numerous, but consideration should be given to the following:**

- **Barriers** - Construction, positioning, etc.
- **Walkways and markings** - Where possible, use traffic signs as are used on the highway. Familiarity will stop confusion.
- Areas that require to be prohibited for emergency reasons or for health and safety reasons should be identified and systems put into place to monitor these.
- Loading bays should be constructed to allow pedestrians such as banks men to be able to seek refuge as a minimum. Wherever possible, pedestrians should not be in a position where they may be at risk from these operations.
- Separation should be considered in areas of dense traffic. This could be afforded by separate gates and doors.

If segregation is not possible, then other systems need to be used. These will include such things as one-way systems, speed control, and mirrors.

Audible warning systems are another means of warning against hazards. However, these should be recognised by all staff and visitors (remember the requirements include all who may be affected, including

people with disabilities).

#### 4.9 Controls for Collisions with Pedestrians.

**Engineering controls** should include all aspects of normal maintenance and should look at the following in particular:

- Speed controls.
- ABS braking systems.
- Anti-jack knife systems.
- The use of convex mirror systems at blind corners.
- Spillage control and drainage systems.
- Designated walkways.
- Fencing and guarding.
- Slip-resistant flooring.

The UK Provision and Use of Work Equipment Regulations 1998 ([PUWER](#)) deal with work equipment used for transport in the workplace and regulation 5 states that all such equipment is maintained in an efficient state, in efficient working order and in good repair.

**Management controls** should be integrated for other statutory requirements and should encompass the following systems:

- Risk assessments - to identify what is a problem, what is in place at the moment and what needs to be put into place.
- The use of traffic systems with appropriate signs which can be easily understood.
- Maintenance systems such as planned preventative maintenance.
- The use of information, instruction, training and supervision. These should be maintained and reviewed as a part of the management systems.
- Staff selection and specific training e.g. FLT drivers, banksmen, crane operators.

**Behavioural controls** should always start at the management level and this should be given by example. Standards that are required by the legal process should be aimed for, and in most cases, should be surpassed.

**The required standards should be communicated to all involved in the process, and should be looked at in the following:**

- Supervision - any members of staff trained as supervisors should understand their responsibilities
- Training should be carried out at all levels of the [organisation](#), and should be indicated by risk assessment, statutory requirements, etc. This training must be relevant, on-going and recorded.
- Controls can be achieved in conjunction with design and layout of the working [environment](#).

Control strategies for vehicle operations will involve risk assessments to determine where and how accidents are likely to happen.

**External and internal traffic routes need to be assessed and thought should be given to the following:**

- Traffic routes, speed limits, visibility, loading and storage areas.
- Separation of vehicles and pedestrians.

- One-way traffic systems.
- Environmental conditions such as the weather, road conditions, visibility.
- Parking areas for staff and visitors.
- Road markings and suitable, visible traffic signs within the site and on access roads leading to and from the site.
- Pedestrian crossing areas.
- Induction training for site visitors, employees and contractors.

#### 4.10 Control Strategies for Pedestrian Hazards Summary.

##### Control strategies for pedestrian hazards.

##### Risk assessment:

- Slip-resistant surfaces;
- Spillage control and drainage;
- Designated walkways;
- Fencing and guarding;
- Use of signs and personal protective equipment;
- Information, instruction, training and supervision.

##### Maintenance of a safe workplace:

- Cleaning and housekeeping requirements;
- Access and egress;
- Environmental considerations (heating, lighting, noise and dust).

#### 5.0 Working at height.

All activities in construction are potentially hazardous; however, the largest single problem is falls from height. Over the years, this has always been the main [accident](#) cause and has remained fairly constant. Realistically, so much work is undertaken at height that this is inevitable, though not acceptable.

The hazard from falling is the greatest risk to be encountered by any person on a construction activity. The potential for harm becomes greater as the height of the fall increases.

There is a requirement to implement specific control measures, such as guard rails, wherever there is a danger of any person falling from heights.

It is also necessary to consider who actually has the accidents, i.e. analysis by occupation, to give an indication of the more hazardous activities.

It is interesting to note that labourers have the most accidents but, as they represent a large percentage of the workforce, there may not be a correlation with the number of accidents. However, if you consider that most of the trades in the construction industry work at height, this does balance the figures slightly.

##### There are a variety of activities that involve working at height which include:

- 1. The erection of the structure which may be steel frame, concrete, timber frame or traditional brick built.



- **2.** The placing of facade panels, curtain walling, glazing, beam and block or concrete plank flooring.
- **3.** All roof work whether traditional tile or slate or industrial type.
- **4.** Lifting operations which may include tower cranes, piling work, hoists, powered access platforms and elevators.

In addition, falls can result from work on demolition or excavation sites or in confined spaces.

Not every activity or task can be identified as there are too many and the industry is too diverse.

### **Working above ground level.**

- Basic hazards of work above ground level include fragile roofs, deterioration of materials, unprotected edges, unstable/poorly maintained access equipment, weather and falling materials.
- Main precautions necessary to prevent falls and falling materials, include the use of guard rails, fencing, toe boards, platforms, ladder hoops, access boards and fall arrest harnesses.
- Requirements for head protection.
- Safe working practices for common forms of access equipment, include scaffolds (independent tied and mobile tower), mobile elevating work platforms and ladders.
- [Inspection](#) requirements for scaffolds.

Falls account for a great number of accidents in the construction industry; 50% of those killed are due to falls from a height. All too often, the correct equipment may have been provided but not properly used.

### **The safety rules you might consider for the prevention of falls would include:**

- No work at height unless it is essential and work at height is unavoidable.
- Ensure that the working platform, of whatever type, is safe and secure, checking that it is strong enough to support the weight of the worker(s) and any equipment that they may be using.
- Check also that it is stable and will not overturn (for example: all types of scaffolding needs to be tied to a supporting structure) the ground is stable and will support the structure.
- Provide guard-rails and barriers at all openings on floors, close to edges on roofs on working platforms.

On a recent inspection of the demolition of a large factory, the following example of an inadequate barrier was encountered. The workers were dismantling conveying machinery and had to first remove the handrails to the side of the walkways to gain easy access.





**Figure 1.**

- Rope across a fall hazard.
- The fall was 30 m.
- You will also note that there is no intermediate rail and no warning signs.
- It should go without saying that this is not suitable fall prevention.

The workers on this job explained that the duration of the work was only going to take a day, and that they had been careful. However, a fall can take just seconds and all the care in the world cannot take the unexpected into account.

**Main precautions necessary to prevent falls and falling material.**

**ILO Safety and Health in Construction Convention C16:** Requirements for safe work above ground level.

**SCAFFOLDS AND LADDERS.**

- 1. Where work cannot safely be done on or from the ground or from part of a building or other permanent structure, a safe and suitable [scaffold](#) shall be provided and maintained, or other equally safe and suitable provision shall be made.
- 2. In the absence of alternative safe means of access to elevated working places, suitable and [sound](#) ladders shall be provided. They shall be properly secured against inadvertent movement.
- 3. All scaffolds and ladders shall be constructed and used in accordance with national laws and regulations.
- 4. Scaffolds shall be inspected by a [competent person](#) in such cases and at such times as shall be prescribed by national laws or regulations.

**5.1 Working at Height.**

**Diagram Missing**

- Basic hazards of work above ground level include fragile roofs, deterioration of materials, unprotected edges, unstable/poorly maintained access equipment, weather and falling materials.
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Rope across a fall hazard.

The fall was 30m.

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It should go without saying that this is not suitable fall prevention.

The workers on this job explained that the duration of the work was only going to take a day, and that they had been careful. However, a fall can take just seconds and all the care in the world cannot take the unexpected into account.

## 5.2 General Roof work.

There is usually a risk of falling during roof work due to the [likelihood](#) that there is a void below the work area, which at the very least is one storey high, i.e. 2.7 metres and may be of much greater height as in a high-bay storage warehouse. The prevention of falls is again paramount and the use of safety nets, although not preventing the fall, reduces the risk rather than relying on a safety harness. The risk of falling for tradesmen during the erection of a roof presents a different problem.

With a traditional timber roof, the risks have been reduced by the common practice of using prefabricated roof trusses. This reduces the time that a carpenter is working at height. Although a certain amount of work can be achieved from the perimeter scaffold, eventually it becomes necessary for the carpenter to climb into the roof trusses to fix the straps and brace timbers.

Since the recent advent of the risk assessment process, the use of safety nets has been introduced. This involves the fixing of specially designed cramps that fit over the top of the wall at plate height, to which pre-designed and sized safety nets are hooked. The nets are tensioned to hang just below the bottom of the trusses. Although this does not prevent the fall, it does mean that should a carpenter fall, the distance is reduced to an acceptable level. This system does rely upon the strength and [integrity](#) of the wall which may not have reached full design strength when trusses are placed. Also, if not correctly tensioned there may be sufficient stretch in the net whereby the falling person's weight can make contact with the floor.

A more recent innovation is the use of individual air-bags which are placed on the floor below and expanded to just beneath the trusses. The risks with this are slipping between the air-bags or possibly bouncing out of an adjacent window. For industrial roofs, particularly flat roofs, the risk of falling is high. Reliance on safety harnesses is of limited benefit and relies on the roofer remaining connected at all times. With the need to move freely, there eventually comes a time when the roofer forgets to reconnect, with the inevitable result. For this type of work, the use of safety nets probably provides the highest level of safety and an easier way of working. Roof tilers are also at risk. However, the traditional method of using the tile battens as the access has not yet been replaced with an alternative method. This still relies on the experience and training of the operatives.

## **Requirements for roof work: ILO Safety and Health in Construction Convention C167.**

### **Article 18 Work at Heights including roof work.**

- 1. Where necessary to guard against danger, or where the height of a structure or its slope exceeds that prescribed by national laws or regulations, preventive measures shall be taken against the fall of workers and tools or other objects or materials.
- 2. Where workers are required to work on or near roofs or other places covered with fragile material, through which they are liable to fall, preventive measures shall be taken against their inadvertently stepping on or falling through the fragile material.

## **5.3 Lifting Operations.**

Falls from height from cranes are more likely to occur during access by the operator or maintenance/erection procedures. On tower cranes, a proper means of access is provided through the mast by a vertical ladder surrounded by hoops and with intermediate rest platforms. For maintenance operations out along the jib, there is often a walkway but not a [guard rail](#). A built-in running line is provided with the operator wearing a harness. During erection and dismantling, the use of harnesses is common practice.

On mobile cranes where the operator can fall more than two metres, guard rails are usually provided as part of the [machine](#) design. If work needs to be undertaken at height, the use of a man riding cage lifted by the crane provides a safe place of work. Any cage should be properly designed and tested and include adequate guard rails to prevent a person falling, being trapped, crushed or struck. There should also be suitable means to stop the cage falling.

The risk of injury during lifting operations is from the associated hazards, e.g. falls of material, being hit by the load or the machine, overturning of the crane and contact with overhead electric cables. All loose materials should be contained when lifting in stillages or similar. Packs of bricks or blocks should be contained by cargo nets. Avoiding being hit by or overturning the crane relies on safe systems of work and competent crane operators. Contact with overhead cables could prove fatal and relies on segregation by use of barriers and goalposts.

There are many types of powered access platforms available from which a person could fall. There is a risk of being tipped out during manoeuvring operations from hitting obstructions both at high and low level. Generally the wearing of a safety harness is recommended as secondary protection.

Most hoists have built-in safety in the form of interlocking gate systems. The risk from falling when moving materials may be from the use of elevators or similar machines that rely on removable guard rails at discharge points. Sheet piling work does not have the same degree of risk as in the past when it was common practice for the operative to sit on top of the previously placed pile to guide the next one into place. The introduction of remote release systems for guiding and detaching the pile removes this problem. The use of man-riding cages is also more prevalent. Where gate systems are used, the platform must have suitable edge protection with guard rails and toe-boards. A suitable ladder access must also be provided.

## **5.4 Video: Working at Heights.**

### **5.4 Video : Working at Heights.**

## 5.5 Working at Heights - Controls.

The following sections will now look at the control measures to eliminate or reduce the risks from working at heights.

### This section will cover:

- Scaffolding.
- Ladders.
- Emergency procedures.
- Short duration work.
- Guard Rails and toe boards.
- Work platforms.
- Inspections.

## 5.6 General Access Scaffold.

The main hazard for the worker on site is falling from - or through - the scaffold. The provision of guard rails is essential. The top guard rail must be a minimum of 950mm above the edge from which any person is liable to fall; usually, this will be positioned at 1000mm (1m) high by most scaffolders. Note that this measurement of 1m ties in with most proprietary scaffold systems, e.g. kwik-stage, cuplock, etc. To prevent falls whilst kneeling, an intermediate guard rail must be provided whereby there shall not be an unprotected gap exceeding 470mm between any guard rail, toe-board, barrier or any similar means of protection.

To prevent injury to those passing below, scaffold toe-boards or other similar means of protection shall not be less than 150mm high to prevent loose material, etc., being dislodged and falling onto any person below. Usually, this will be achieved by placing a scaffold board on edge.

### The safe erection of the scaffold depends upon certain factors:

1. The strength and [stability](#) of any surface upon which it is placed.
2. The stability of any structure to which the scaffold is secured.
3. The integral strength achieved by all the component parts, e.g. [ledgers](#), bracing, etc.
4. The safety of the working platform that shall not be less than 600mm wide.
5. No gaps in the surface giving rise to injury.
6. The risk of slipping.
7. Ensuring that persons cannot become trapped between the scaffold and any adjacent structure.
8. Provision of reasonable hand-holds.
9. Ensuring that the scaffold is not overloaded to cause danger of collapse or deformation.

These general principles can be applied to any place of work.

## 5.7 Alternative Scaffolds.

Scaffold towers offer an alternative to general access scaffolds for short-term work. Traditionally, they were made of scaffold components and the same principles apply as for scaffolding. Sometimes, the towers need to be mobile and they can be fitted with castors which must have the facility to be locked when stationary and the tower is in use.

**For stability, the height/least base ratio should not be greater than the following:**

1. Static internal tower 4:1.
2. Static external tower 3.5:1.
3. Mobile internal tower 3.5:1.
4. Mobile external tower 3:1.

The height to be measured in the above ratios is to the platform level.

The recommended maximum free standing height for static towers is 12 metres and for mobile towers 9.6 metres. Ladder access should be vertical and lashed to one of the narrowest sides, preferably inside the base area, with the ladder resting on a [transom tube](#).

Prefabricated towers are more common these days and there are several different types of towers available which are comparatively easy to erect and offer an excellent alternative to traditional scaffolding. These towers are also mobile and will normally be prefabricated aluminium. The lightness of the material makes them easier to erect, rather than traditional steel scaffolding. In either form, competent and trained personnel are required to erect the tower.

### **5.8 Ladders.**

The majority of access from one level to another in the construction industry is by ladder.

This creates the possibility for a variety of hazards which include incorrect specification (i.e. the ladder is too long, too short, not strong enough for the task), poor maintenance (ladders can fall into disrepair and rungs can become loose or warped), poor use (ladder is not secured properly, etc.) and poor placement (traffic could cause the ladder to be knocked), all of which could result in serious injury.

Apart from falls, other risks include electrical shock by using a metal ladder too close to electrical cables which could result in death. Access can be achieved safely, providing the basic requirements described in the checklist below are followed.

### **5.9 Safe Use of Ladders.**

**The Safety and Health in Construction (ILO [Code of Practice](#)) states certain safety measures which should be adopted for the use of ladders on construction sites; these are noted below:**

- All ladders should be in good order, if faulty they should be scrapped.
- Ladders should be placed on a firm, level base.
- They should be equally supported on each stile( side of the ladder).
- They should be lashed or secured near the top to some convenient secure anchorage to prevent the base from slipping outwards and the top from sliding sideways. Only the stiles should be lashed and each stile should be lashed separately.
- The correct slope for a ladder is about 75° to the horizontal, i.e. 1 metre out at the base for every 4 metres of height.
- If no other means of fixing a ladder to prevent slipping can be found, then someone must hold it at the base when it is being used - but this is only effective to a height of 6.0 metres.
- Ladders should always be placed so that there is space behind each rung for proper foothold. Particular care should be taken at this point on the landing platform.
- The ladder should protrude approximately 1 metre above a platform to afford a safe handhold when stepping off.



A ladder may be used for *short-term work*; however, it should not involve stretching to reach any work. The ladder must be secured to prevent slipping and a good handhold must be available.

- **For short-term work.**
  - An extension ladder may be more suitable and give greater flexibility.
  - Short-term work is normally deemed to be less than 30 minutes.

For any ladder work, a risk assessment should be undertaken. This should identify a safe method of work using a work platform.

### 5.10 Emergency Procedures.

Wherever a foreseeable hazard is identified, then a [safe system of work](#) should be implemented which provides suitable rescue/emergency arrangements. Ideally, the risk assessment should identify that the risk is not acceptable and lead to a safer alternative.

It is important that all persons involved understand the risks and the need to take the appropriate precautions. The risk can be reduced by ensuring that all personnel involved have received the appropriate training. However, this cannot be relied upon and where there is a need for emergency procedures, then drills must be undertaken to ensure the effectiveness of the procedure.

A range of plant and equipment (e.g. scaffolds, cranes, hoists, [electrical equipment](#) and excavations) needs to be inspected on a regular basis by a competent person to ensure safety. Records of inspection may also be required.

Regular inspection is important, but it is also essential that when defects are identified by the inspection, or reported by people using the equipment, either the defects are remedied immediately or work is stopped until necessary repairs are completed.

### 5.11 Emergency Plans.

The purpose of emergency plans is to ensure that everyone on site reaches safety if there is a fire. Small and low-risk sites only require very simple plans, but higher risk sites will need more careful and detailed consideration.

#### **An emergency plan should:**

- Be available before work starts;
- Be up to date and appropriate for the circumstances concerned;
- Make clear who does what during a fire;
- Be incorporated in the construction-phase [health and safety plan](#).

On larger high-risk sites, fire drills may be appropriate. You should know what you need to do if there is a fire; managers need to make sure that everyone on their sites knows what to do. Regular checks should be made to ensure that fire precautions are in place.

The safe storage, handling and labelling of hazardous materials and substances on construction sites is essential in preventing fires and other incidents. The same rules apply to construction sites as with any other work place; keep things that will burn away from ignition sources, store materials safely, train employees in fire prevention and what to do in the case of an emergency.



### 5.12 Edge Protection.

Both the edge and any openings need to be protected. It will often be more appropriate to securely cover openings rather than put edge protection around them.

#### **Any protection should be:**

- In place from start to finish of the work;
- Strong enough to withstand people and materials falling against it.

Where possible, the edge protection should be supported at ground level, e.g. by scaffold standards, so that there is no obstruction,. If the edge is too high for this, the sounding structure can support the edge protection, provided it is strong enough.

Edge protection can also be supported by frames, counterweights or scaffolding. The protection should be in place at all times. Guarding systems are widely available that enable repair work or alteration to carry on without removing any guard rails.

#### **Demarcating safe areas.**

Full edge protection may not be necessary if limited work involves nobody going any closer than 2 m to an open edge.

In such cases, demarcated areas can be set up, outside which nobody goes during the work or access to it.

#### **Demarcated areas should be:**

- Limited to areas from which nobody can fall;
- Indicated by an obvious physical barrier (full edge protection is not necessary but a painted line or bunting is not sufficient);
- Subject to tight supervision to make sure that nobody strays outside them (demarcation areas are unacceptable if this [standard](#) is not achieved).

### 5.13 Short Duration Work.

Short-duration means a matter of minutes rather than hours. It includes such jobs as brief inspections or adjusting a television aerial etc.

#### **Appropriate safety measures are essential.**

It may not be reasonably practicable to provide edge protection during short-duration work. In such cases, anyone working nearer than 2m to any unguarded edge should be using a safety harness.

#### **Where safety harnesses are used, they need to be:**

- Appropriate for the user and in good condition - full harnesses are essential, safety belts are not sufficient;
- Securely attached to an anchorage point of sufficient strength;
- Fitted with as short a lanyard as possible that enables wearers to do their work;
- Actually used - tight management discipline is needed to ensure this.

### 5.14 Guard Rails & Toe Boards.

These should be provided whenever there is a risk of falling or falling objectives and should be made from material strong enough to prevent people from falling off and to withstand other loads likely to be placed against them, bricks and such like.

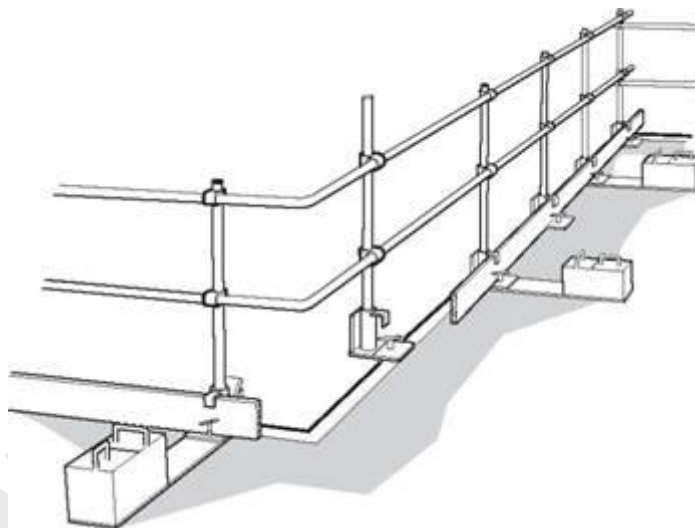


Figure 1.

If the risk comes from falling through openings or fragile material such as [asbestos](#) roofing or roof lights, an alternative to guard rails or a barrier is to cover the opening or fragile material with something more robust.

An associated function of toe boards is to prevent tools and materials from inadvertently being kicked off the side and this will apply to work at height or work above excavations.

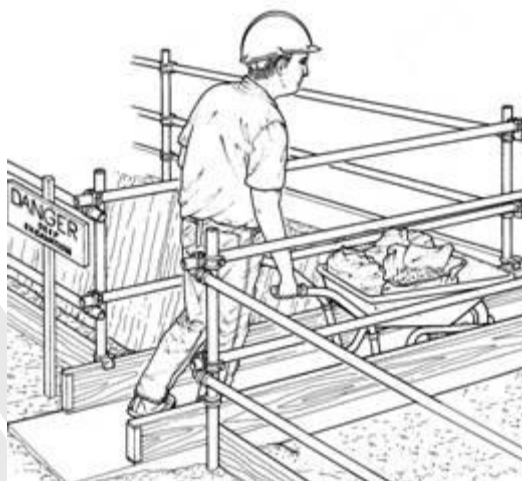


Figure 2.

### 5.15 Selection of Work Platforms.

A work platform is the place where people stand whilst working.

**It is clearly essential to give thought to the type of platform to be used; the choice is wide and includes:**

- Scaffolding (including fixed general access scaffolding and tower scaffolding).
- Mobile elevating work platforms (MEWPs).
- Temporarily suspended access platforms and cradles which may be suspended from the building itself or from a separate crane.



**Figure 1.**

In the latter category, we might include sizeable suspended platforms capable of supporting several men and their equipment through to the Boatswain's (bosun's) chair (the smallest type of platform) and various rope access techniques e.g. abseiling which could be appropriate for inspection purposes.

**Those responsible for managing the site need to consider:**

- The length of time that the equipment is to be in use.
- Any risks to personnel during the building of the structure.
- Any maintenance problems if the platform will be up for a long period of time.
- How many people will be using the equipment, and how often.
- Any problems securing the equipment to prevent the possibility of intruders, particularly children, climbing up.
- At what stage in the construction programme the work platform will be brought into use.

**Working platforms should be adequately supported and provided with guard rails or barriers and should be:**

- Wide enough to allow people to pass safely and use any equipment or material needed for their work;
- Free of any openings or traps through which people's feet could pass;
- Constructed so as to prevent material falling through;
- If there is a wire mesh floor, the mesh should be fine enough to prevent materials, especially bolts and nails, from falling through;
- Kept free of tripping and slipping hazards;
- Kept clean and tidy.

**In this section, we have looked briefly at the general safety aspects of work platforms; we will now turn to look in more detail at the various types of platform:**

- General access scaffolds and tower scaffolds.

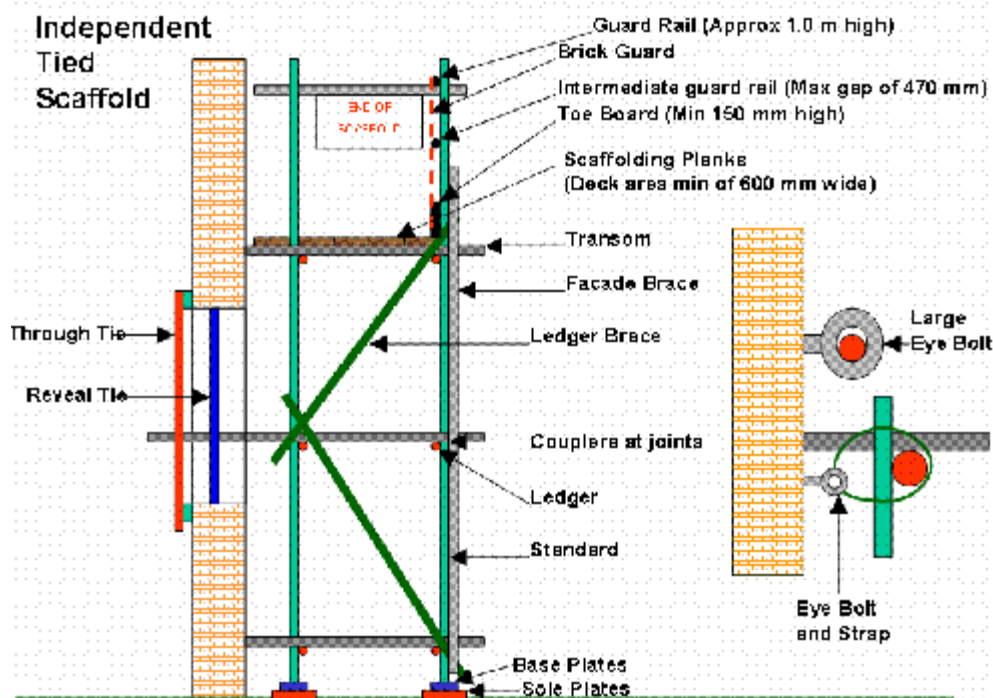
- Mobile elevating work platforms.
- Temporarily suspended platforms and cradles.
- Boatswain's chairs and rope access techniques.

### **What about ladders?**

They are not to be seen as another form of work platform (apart from short-term [light](#) work); ladders are a means of accessing work platforms.

## **5.16 General Access Scaffolds & Tower Scaffolds.**

### **General access scaffolds.**



**Figure 1. General Access Scaffold.**

Any scaffold must be planned, erected, altered, dismantled and checked by persons who have the appropriate competence.

### **It is vital to ensure that the scaffold, of whatever type is:**

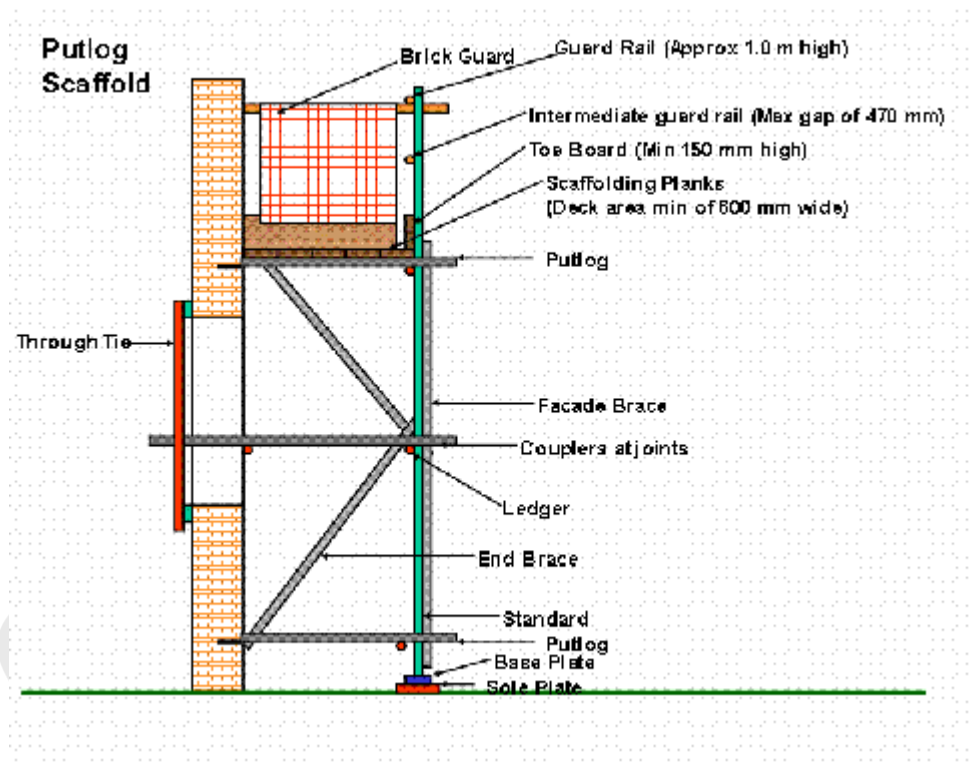
- Based on a firm, level foundation, taking care of basements, drains, or patches of soft ground, which could collapse when loaded;
- Braced and tied into a permanent structure or otherwise stabilised;
- Capable of supporting loads likely to be placed on it.

### **The illustration above shows an [independent tied scaffold](#):**

- **Independent:** The scaffold is a complete structure in its own right.
- **Tied:** The scaffold is firmly attached to the building by making use of openings such as doors and

windows.

The illustration below shows putlog scaffolding which uses a series of [putlogs](#) (see figure below) to support the scaffold and hold it securely.



**Figure 2. Putlog Scaffolding.**

**NEBOSH** do require that you know the meaning of some of the structural terms used in scaffolding:

- Standard;
- [Toe board](#);
- Sole plate/board;
- Transom;
- Ledger;
- (zig-zag) Bracing;
- Working platform;
- Guard rail.

**Whether the scaffold is independent tied or putlog or a combination of these, it is essential to ensure that:**

- Platforms are fully-boarded and wide enough for the work and for access;
- Scaffold boards are properly supported and not overhanging excessively;
- There is a safe ladder or other means of access to the work platform.

This type of scaffold will probably be used for work on an existing building, the scaffold being erected alongside the building and holding on very firmly via the ties.

Inspection and maintenance of scaffolds is covered in the ILO code of practice, Safety and Health in Construction.

#### 4.4. Inspection and maintenance.

4.4.1. Scaffolds as prescribed by national laws or regulations should be inspected, and the results recorded by a competent person:

- (a) Before being taken into use;
- (b) At periodic intervals thereafter as prescribed for different types of scaffolds;
- (c) After any alteration, interruption in use, exposure to weather or seismic conditions or any other occurrence likely to have affected their strength or stability.

4.4.2. Inspection by the competent person should more particularly ascertain that:

- (a) The scaffold is of suitable type and adequate for the job;
- (b) Materials used in its construction are sound and of sufficient strength;
- (c) It is of sound construction and stable;
- (d) That the required safeguards are in position.

#### 5.17 Video: Introduction to Scaffolding (Basic terms).

This video was produced by the [HSE](#) and covers basic terminology.

[scaffolding.co.uk/file...](#)

#### 5.18 Tower Scaffolds.

Tower scaffolds are widely used and are involved in numerous accidents each year. These usually happen because the tower is not properly erected or used. Aluminium towers are light and can easily overturn. Towers rely on all the parts being in place to ensure adequate strength. They can collapse if sections are left out.



Figure 1.

#### Erecting the tower.

A wide range of prefabricated towers are available. The manufacturer or supplier should provide an



adequate instruction manual which should give advice on the erection sequence and bracing requirements. If the tower has been hired, the hirer should provide this information. This information should be passed on to the erector. The person erecting the tower should be competent.

### **Stability.**

Make sure the tower is resting on firm level ground with the wheels or feet properly supported. Do not use bricks or building blocks to take the weight of any part of the tower.

The taller the tower, the more likely it is to become unstable. As a guide, if towers are to be used in exposed conditions or outside, the height of the working platform should be no more than three times the minimum base dimension. If the tower is to be used inside, on firm level ground, the ratio may be extended to 3.5. Using this guide, if the tower base is 2m by 3m, the maximum height would be 6m for use outside and 7m for inside. Always check the safe height to base ratio in the instruction manual.

### **Remember, the stability of any tower will be affected if it is:**

- Sheeted and/or likely to be exposed to strong winds;
- Loaded with heavy equipment or materials;
- Used to [hoist](#) heavy materials or support rubbish chutes;
- Used for operations involving heavy or awkward equipment, e.g. grit blasting, water-jetting, etc;
- Climbed from the outside;
- Used as a support for ladders.

In these cases, extra support or alternative height to base ratios may be needed.

### **Before using the tower always check that the:**

- Scaffold is vertical;
- Wheel brakes are on.

### **Access.**

There must be a safe way to get to and from the work platform.

### **It is not safe to climb up the end frames of the tower except where:**

- The frame has an appropriately designed built-in ladder;
- A purpose-made ladder can be attached safely on the inside.

Check with the manufacturer or supplier before fitting a ladder to the outside. Always make sure there is a secure handhold at all landing places.

### **Edge protection.**

Provide suitable edge protection on platforms where a person could fall. Guard rails should be at least 950mm high and toe boards at least 150mm high. An intermediate guard rail or suitable alternative should be provided so the unprotected gap does not exceed 470mm.

Brick-guards or other barriers may be used instead of the intermediate guard rail as long as they are strong enough and placed so no one can fall through them.

### **Moving the tower.**

#### **When moving a tower:**

- Check that there are no [power](#) lines or other overhead obstructions.
- Check that the ground is firm and level.

- Push or pull only from the base; never use powered vehicles.
- Never move it while there are people or materials on the upper platforms.
- Never move it in windy conditions.

### **Protecting the public.**

#### **When towers are used in public places, extra precautions may be needed:**

- Minimise the storage of materials and equipment on the working platform.
- Erect barriers at ground level to prevent people from walking into the tower or work area.
- Remove or board over access ladders to prevent unauthorised access if it is to remain in position unattended.

Before you use a tower in a public place, check whether you need a licence from the local [authority](#).

### **Scaffold inspection.**

#### **Tower scaffolds must be inspected by a competent person:**

- Before first use;
- After substantial alteration;
- After any event likely to have affected its stability.

If the tower remains erected in the same place for more than seven days, it should also be inspected at regular intervals (not exceeding seven days) and a written report made. Any faults found should be put right.

Tower scaffolds can be erected quickly and used properly, can give good safe access. However, they have been involved in numerous accidents because they have not been erected or used correctly, the manufacturer's instructions must always be followed.

If the scaffold is owned by the company using it, a copy of the instruction manual must be available. If the scaffold has been hired, the hirer must provide this information.

#### **For all types of tower scaffold, the requirements are to ensure that:**

- The tower is vertical;
- The legs are resting properly on firm, level ground all wheels and outriggers are locked;
- There is a safe means of access, for example, an internal ladder;
- Edge protection is provided for all platforms more than 2 metres above the ground.

In situations where the tower will be subject to extra stresses (for example if the tower is protected by weather-proof sheeting, used for grit blasting or lifting heavy loads), it will be necessary to provide additional support which might include tying to the structure being served.

## **5.19 Mobile Access Equipment.**

There will be many occasions when it will not be possible to work from an existing structure and the use of a scaffold-based working platform would not be appropriate.

#### **A range of mobile access equipment can be used, including:**

- Mobile elevated working platforms (MEWPs);
- Mast platforms which are, in essence transportable lifts which are brought to the required place of

work.

(cradles, bosun's chairs or seats, rope access equipment which we will look at later).



**Figure 1.**

It is essential that personnel who are going to use such equipment should be well-trained and competent to operate it. They should also learn emergency and evacuation procedures so that they know what to do, for example, if the power supply to the platform fails or fire breaks out in the building where the work is taking place. This information should be given on a hand-over certificate which will be provided by the supplier/installer. The certificate must also provide all the relevant information about safe working loads and so on.

**The safe system of work must ensure that:**

- The area where the work is to be carried out is barriered off or made secure to prevent unauthorised entry;
- People cannot be struck by any moving parts as the platforms rise or descend;
- The platform is protected from [damage](#), in particular by being struck by passing vehicles;
- The access equipment is secure and capable of withstanding high winds if it needs to be used outside.

It is probably worth saying a few specific words about MEWPs.

**Mobile elevated work platforms (MEWPs).**

MEWPs can provide excellent safe access to high level work.

**Anyone responsible for use of a MEWP must ensure that:**

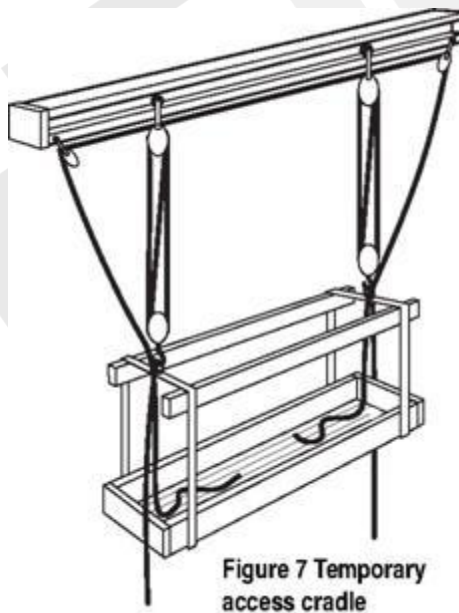
- The operator is fully trained;
- The MEWP is provided with guard rails, toe-boards and other suitable barriers;
- The MEWP is used on firm and level ground with tyres properly inflated;
- Any outriggers are extended and chocked as necessary before the platform is raised;
- Everyone concerned knows what to do in the event of a failure of the platform in the raised position.

Users of MEWPs must never operate the MEWP near overhead cables or other dangerous machinery or move the equipment with the platform in the raised position.

## 5.20 Cradles.

**Most accidents involving temporarily suspended access cradles and platforms happen because of:**

- Unsafe access to and from the cradle;
- Insufficient or poorly secured counterweights or other systems for holding the cradle or platform in place;
- Failure of the cradle platform or components, probably because manufacturer's instructions on erection and dismantling have not been followed.



**Figure 7.**

**Anyone using a cradle must check that:**

- It has adequate guard-rails and toe-boards and material cannot fall off;
- It can be fitted close to the building which must be capable of carrying the loads placed upon it;
- A secondary safety rope fitted with a fall arrest device is provided and used;
- Adequate operating instructions and technical support are available;
- There is safe access into, and safe egress from, the cradle.

In situations where it is not practicable to provide a solid working platform, boatswain's chairs can be used for light, short-term work. In general, the chair comprises a seat supported on a shock-absorbing line (lanyard) via a central suspension point and a carrying point for tools.



**Botswain's chair**

**Figure 8.**

Rope-access techniques, sometimes known as abseiling, are generally used for inspections rather than actual construction work. Again, they should only be used where access from a working platform is not practicable.

It goes without saying that the erection, maintenance and use of any chair and rope techniques requires training and competence.

#### **Safety harnesses.**

For work at heights, providing a safe place of work and system of work to prevent falls should always be the first consideration. However, there may be circumstances in which it is not practicable for all or any of the requirements for guard rails etc. to be met, for example where guard rails have to be taken down for a short period of time to (un)load materials.

Where people may still approach an open edge from which they would be liable to fall, other forms of protection will be needed and in such cases, a suitably-attached harness and line could allow safe working.

It is important to remember that a harness will not prevent a fall; it can only minimise the risk of injury. The person who falls may be still be injured when the line goes tight and/or by striking parts of the structure during the fall.

#### **Ladders.**

Ladders are a means of getting to a workplace. They may be used as a workplace in their own right for light short-term work only.

**If it is not possible to provide a better means of access and ladders have to be used, it is necessary to make sure that:**

- The ladder(s) are in good condition;
- The ladder(s) can be fixed to prevent running sideways or slipping away from the wall;
- The bottom of the ladder is supported on a firm level surface, if possible making use of ladder feet;



- If the bottom of the ladder cannot be fixed then a second person should foot the ladder, both to hold it firmly and as a look-out to stop people walking into it;
- The ladder should extend a sufficient height above the landing place to ensure that workers can safely and comfortably transfer from and to the ladder.

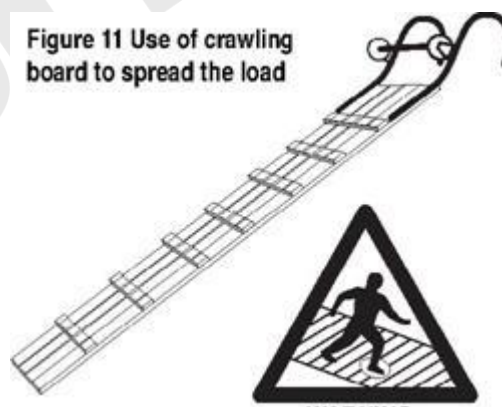
All light tools should be carried in a shoulder bag or holster attached to a belt leaving both hands free; heavy or bulky loads simply must not be allowed.

As a rule of thumb, the ladder needs to be one unit of measurement out for every four up. Particular care is needed with step ladders which are so prone to overturn when subject to any kind of side loading, caused for example by over-reaching.

### 5.21 Roof Work.

Firstly, good housekeeping is vital, keeping platforms clear of all loose materials. The next line of defence comprises toe boards, solid barriers, brick guards or similar arrangements at open edges. In public places, arrangements such as nets and covered walkways may be needed to give the necessary protection. Plastic sheeting may be required to keep down dust levels and control water sprays.

#### Roof work.



**Figure 11.**

Almost one in five of the workers killed in construction accidents was involved in roof work at the time of their deaths - fatal accidents happen to both specialist roofers and general construction workers. Most of the deaths are a result of falls, falls from, and falls through.

Sheeted roofs must never be trusted, from whatever material they are made; asbestos cement, fibreglass, steel or plastic. They will become fragile with age and in addition, apparently sound sheeting might not be properly supported.

Roof openings and roof lights are an extra hazard. They may be difficult to identify in certain light conditions, particularly if they have been covered with bituminous paint. The key to work on fragile roofs is to spread the load by the use of purpose-made roof-boards and to post warning notices at suitable places on the approaches to the roof (figure 11).

Guard rails and toe-boards or suitable edge barriers may need to be erected if there is any risk of workers falling from the roof.

**Whenever roof work is going to be undertaken, the worker(s) must be able to:**



- Reach the roof, safely;
- Move across the roof, safely;
- Work on the roof, safely.

## 5.22 Inspection Requirements.

### Inspection requirements,

**This section sets out the specific requirements for the inspection of:**

- Working platforms;
- Personal suspension equipment;
- Excavations;
- Cofferdams and caissons.

It also gives details of the reports which have to be made following certain inspections.

Those in control of workplaces should ensure inspections are carried out by a competent person.

All employers and people in control of construction work should make sure that places of work are safe before they allow their workers to use them for the first time.

Stop work if the inspection shows it is not safe to continue.

### Reports.

**The competent person must:**

- Complete the inspection report before the end of the working period;
- Provide the report or a copy to the person for whom the inspection was carried out within 24 hours.

Reports must be kept on site until the work is complete. Reports should then be kept for three months at an office of the person for whom the inspections were carried out.

A report is not needed following every inspection.

**A report is only needed:**

- For a tower scaffold if it stays in the same place for seven days or more;
- Where an inspection of a working platform or any personal suspension equipment is carried out;
- Before equipment is used for the first time;
- After any substantial addition, dismantling or other alteration;
- Only one report is needed for any 24-hour period;
- Where an inspection of an excavation is carried out, only one written report is needed in any seven day period unless something happens to affect its strength or stability.

**Your record of inspection must include the following information:**

- Name and address of person on whose behalf the inspection was carried out.
- Location of the workplace inspected.
- Description of workplace or part of workplace inspected (including any plant and equipment and materials, if any).
- Date and time of inspection.
- Details of any matter identified that could lead to a risk to the health and safety of anyone.

- Details of any action taken as a result of any matter identified in the last point.
- Details of any more action considered necessary.
- The name and position of the person making the report.

**Note:** Personal suspension equipment is used to provide a place from which to work and includes boatswain's chairs and abseiling equipment. It does not include harnesses and lines which are used solely to limit a fall if one happens.

### 5.23 Inspection Reports.

#### Inspection reports.

**Report of results of every inspection made should include as a minimum:**

1. Site address.
2. Date and time of inspection.
3. Location and description of workplace (including any plant, equipment or materials) inspected.
4. Matters which give rise to any health and safety risks.
5. Can work be carried out safely?
6. If not, name of person informed.
7. Details of any other action taken as a result of matters identified in 5 above.
8. Details of any further action considered necessary.
9. Name and position of person making the report.
10. Date report handed over.
11. Any inspection is only required where a person is liable to fall from a place of work.
12. Any employer or any other person who controls the activities of people using a scaffold shall ensure that it is stable and of sound construction and that the relevant safeguards are in place before their employees or people under their control first use the scaffold.
13. No report is required following the inspection of any mobile tower scaffold which remains in the same place for less than seven days.

**Not more than one report is required for any 24-hour period where an inspection of a working platform or part thereof or any personal suspension equipment is carried out:**

1. Before it is taken into use for the first time; or
2. After any substantial addition, dismantling or other alteration.

Footings	Standards	Ledgers	Bracing	Putlogs and transoms	Couplings	Bridle	Tie	Boarding	Guard rails and toe boards	Ladders
Soft and uneven	Not plumb	Not level	Some missing	Wrongly spaced	Wrong fitting	Wrong spacing	Some missing	Bad boards	Wrong height	Damaged
No base plates	Jointed at same height	Joints in same bay	Loose	Loose	Loose	Wrong couplings	Loose	Trap boards	Loose	Insufficient length
No sole plates	Wrong spacing	Loose	Wrong fittings	Wrongly supported	Damaged	No check couplers	Not enough	Incomplete	Some missing	Not tied
Undermined	Damaged	Damaged			No check couplers			Insufficient supports		

Figure 1.

### Excavations only.

The duties to inspect and prepare a report apply only to any excavation which needs to be supported to prevent any person being trapped or buried by an accidental collapse, fall or dislodgement of material from its sides, roof or area adjacent to it. Although an excavation must be inspected at the start of every shift, only one report of such inspections is required every seven days. Reports must be completed for all inspections carried out during this period for other purposes, e.g. after accidental fall of material.

## 5.24 Requirements for Head Protection.

### Introduction.

Every year in the construction industry, workers are killed and many others injured as a result of head injuries. If those engaged in construction activities wear a safety helmet, the chances of being seriously hurt are greatly reduced.

**Personal protective equipment (PPE)** is always the last line of defence.

**Wherever possible, other measures should first be taken to reduce or control the risk, e.g. :**

- Provide brick guards and toe boards to stop objects falling from the scaffold.
- Keep scaffolds free of loose materials.
- Tie suspended loads securely.

### When should safety helmets be worn?

Suitable head protection, normally safety helmets, should be provided and worn when there is a risk of injury.

If you are in control of a site, e.g. as a [principal contractor](#), you need to think about risks of head injury. There may be risks from falling materials or of knocking into things such as low scaffolds. Unless there is no foreseeable risk of injury, you must provide your employees with safety helmets and decide when, where and how they should be worn.

The employer should make rules governing when and where safety helmets should be worn. These rules apply to everyone on site, and that includes visiting work people such as architects, delivery drivers and utility workers.

These rules should be in writing and should be brought to the attention of all those who may be affected by them so that everyone knows when and where safety helmets are to be worn.

### 5.25 Duties of Employees and the Self-employed.

**Employees must wear their safety helmets properly and follow the instructions of their employer or, in other cases, the rules made by the person in control of the site:**

- They should take care of their helmets and not misuse them.
- Any defects or problems should be reported promptly.
- If safety helmets are not provided on site, the self-employed must supply their own.
- They must wear them when there is a risk of head injury or when told to do so by someone in control.
- They also need to follow the rules made by the person in control of the site and in addition, maintain and replace the safety helmet whenever necessary.

### 5.26 Selection of Suitable Safety Helmets.

Helmets come in a variety of designs and it is important that the right type is provided for the work to be done.

A properly-fitting safety helmet should have the right shell size for the wearer and an easily-adjustable headband, nape and chin strap. The range of size adjustments should be large enough to accommodate thermal liners used in cold weather.

Safety helmets should be as comfortable as possible.

**Comfort is improved by the following:**

- A flexible headband of adequate width and contoured both vertically and horizontally to fit the forehead.
- An absorbent sweatband that is easy to clean or replace.
- Textile cradle straps.
- Chin-straps (when fitted) which fit around the ears, are fitted with smooth, quick-release buckles which don't dig into the skin, are made from non-[irritant](#) materials and can be stowed on the helmet when not in use.

### 5.27 Compatibility with Work to be Done.

Whenever possible, the safety helmet should not hinder the work being done.

For example, an industrial safety helmet with little or no peak is useful for a surveyor taking measurements, or to allow unrestricted upward vision for a scaffold erector:

- **Chin straps** should be provided and used if a job involves work in windy conditions, especially at height, or repeated bending or constantly looking upwards.
- **Helmets** should be compatible with any other PPE, e.g. ear defenders or eye protectors. The

design should allow them to be worn comfortably and remain effective.

Check manufacturers' instructions regarding the compatibility of safety helmets with other types of PPE. Don't attempt to modify existing helmets to take these fittings as this may weaken them.

### 5.28 Maintenance.

Safety helmets must be maintained in good condition.

#### They should:

- Be stored in a safe place, e.g. on a peg or in a cupboard on site;
- Not be stored in direct sunlight or in excessively hot, humid conditions because long-term exposure can weaken the shell;
- Be checked regularly for signs of damage or deterioration;
- Have defective parts replaced (if the model allows this); parts from one model cannot normally be interchanged with those from another;
- Have the sweatband cleaned regularly or replaced.

Before the safety helmet is issued to another person, it should be inspected to ensure it is serviceable and thoroughly cleaned in accordance with the manufacturer's instructions, e.g. using soap and water. The sweatband should always be cleaned or replaced.

### 5.29 Damage to the Shell.

#### Damage to the shell of a helmet can occur when:

- Objects fall onto it;
- It strikes against a fixed object;
- It is dropped or thrown.

Certain chemicals can weaken the plastic of the shell leading to rapid deterioration in shock [absorption](#) or penetration resistance. Chemicals which should be avoided include aggressive cleaning agents or solvent-based adhesives and paints. Where names or other markings need to be applied using adhesives, advice should be sought from the helmet manufacturer.

#### Replacement.

Normally, helmets should be replaced at intervals recommended by the manufacturer. They will also need replacing when the harness is damaged or if it is likely that the shock absorption or penetration resistance has deteriorated. For example, when the shell has received a severe impact, or if deep scratches occur (i.e. to a depth greater than 25% of the shell thickness) or if the shell has any visible cracks.

### 5.30 Some Do's and Dont's for Safety Helmets.

#### Do:

- Wear the helmet the right way round, it does not give proper protection when worn back to front. Safety comes before fashion.
- Keep a supply of helmets for visitors on site. These should be checked before each issue.
- Wear a chin strap if you have to bend forward or down, look up or work where it is windy.

- Wear the helmet so that the brim is level when the head is upright, i.e. don't wear it sloping up or down as this may significantly reduce the protection it can provide.

#### Don't:

- **Use your helmet as a handy basket:** It is designed to fit on your head, not for mixing cement or carrying nails!
- **Paint it or use solvents to stick labels to it, or scratch an identification mark onto it:** The shell could weaken and rapidly deteriorate. The manufacturer can be asked to add a label.
- **Store them in heat or direct sunlight, such as in the rear window of a car:** Excessive heat and sunlight can quickly weaken the plastic.
- Modify, cut or drill your helmet.
- Share your helmet with anyone else on site.

## 6.0 Impact of Temporary Works

### Introduction.

Every year, people are killed or seriously injured when working in excavations. Excavation work has to be properly planned, managed, supervised and carried out to prevent accidents. This unit provides advice for those involved in excavation work.



Figure 1.

### Planning.

**Before digging any excavations, it is important to plan against the following:**

- Collapse of the sides.
- Materials falling onto people working in the excavation.
- People and vehicles falling into the excavation.
- People being struck by plant.
- Undermining nearby structures.
- Contact with underground services.
- Access to the excavation.
- Fumes.
- Accidents to members of the public.

Make sure the necessary equipment needed such as trench sheets, props, baulks, etc. is available on site



before work starts.

## **ILO code of practice, Safety and health in construction.**

### **General provisions for Excavations, shafts, earthworks, underground works and tunnels.**

#### **9.1.**

- **9.1.1. Adequate precautions should be taken in any excavation, shaft, earthworks, underground works or tunnel:**
  - (a) By suitable shoring or otherwise, to guard against danger to workers from a fall or dislodgement of [earth](#), rock or other material;
  - (b) To guard against dangers arising from the fall of persons, materials or objects or the inrush of water into the excavation, shaft, earthworks, underground works or tunnel;
  - (c) To secure adequate ventilation at every workplace so as to maintain an atmosphere fit for respiration and to limit any fumes, gases, vapours, dust or other impurities to levels which are not dangerous or injurious to health and are within limits laid down by national laws or regulations;
  - (d) To enable the workers to reach safety in the event of fire, or an inrush of water or material;
  - (e) To avoid risk to workers arising from possible underground dangers such as the circulation of fluids or the presence of pockets of [gas](#), by undertaking appropriate investigations to locate them.

### **6.1 - Excavation.**

Digging and working in and around excavations and trenches can be high-risk activities.

Each year, construction workers are killed in both deep and shallow excavations, regardless of the number of years' experience they have of such work.

Collapse of excavations due to inadequate support claims many construction workers' lives as well as maiming many more each year - especially considering the fact that one cubic metre of earth weighs approximately 1.3 tons.

In carrying out an excavation, the soil conditions can vary widely, often in short distances. Very few ground surfaces can be relied upon to stand with little or no support for the duration of the work - a fact even the most competent worker can forget, as ground surfaces can be deceptive.

So whenever an excavation has to be undertaken, adequate prior consideration needs to be given to the soil conditions that will be met, the method of excavation to be used and the manner in which any necessary support will be provided.

This may mean that soil tests or trial holes may be required to determine the conditions likely to be found on the site, particularly of course for larger excavations.

**The main regulations for working within or creating excavations, is:**

***"The Construction, Design & Management Regulations 2007"***

Each regulation is written in order to ensure all excavation and relevant work is undertaken as safely as possible, with little risk to the workers, but each has its own individual and in-depth requirements.

The [CDM](#) Regulations provide a framework for the management of the work, as well as stipulating the requirement for all information regarding any hazards identified prior to construction to be included in the Health and Safety Plan.

Above all, groundwork needs to be properly planned, undertaken and maintained by people with suitable expertise in order to prevent accidents.

Never underestimate the risks involved in working in excavations.

## 6.2 Hazards of Work in an Around Excavations.

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Never underestimate the risks involved in working in excavations.

## 6.3 Video: Excavations.

### 6.3 Video: Excavations.

### 6.4 Avoiding Underground Services.

The locations of underground services are often very difficult to identify, therefore the likelihood of accidentally hitting them is quite high.

**The accidental hitting of underground services can have varying results depending on the type of service involved:**

- Hitting electric cables could cause electrocution & burns to the worker.
- Hitting gas pipes can release gas which, if a source of ignition is present, will explode.
- Water mains, when damaged, could fill the excavation with water very quickly.
- Exposure to sewer and drain piping could release dangerous substances into the excavation area.

Therefore, it is best practice to assume that all underground services are live unless proved dead by the relevant authority.

### 6.5 Underground Cables.

Many ground workers are injured when they come into contact with underground cables. Simple precautions by those planning the works could markedly reduce these risks.

The position of any underground cable should be ascertained before construction work commences. This information should be made available by the planning supervisor or project manager.

Alternatively, contact should be made with owners or the electricity company to obtain this information. A drawing with accurate locations and routes should be made available.

### 6.6 Overhead Lines.

#### **Overhead Lines.**

Considering that overhead lines are visible, it seems incredible that persons, plant and equipment come into contact with them. Many accidents do, however, occur with fatal results. It should be remembered that most overhead cables above 200V are uninsulated. It is difficult to judge height and distance when looking into the air as there is nothing to measure against and this misjudgement is the reason that overhead lines are hit.

The only way of achieving safety in this area is by segregation. There should be no work or storage of materials underneath the lines. A check should be made with the electricity company to see if the electricity supply can either be diverted or switched off while the work is carried out. The provision of barriers at a safe distance is required. Should plant need to pass under lines then designated safe routes need to be provided. Warning signs should be in place that gives details of the safe height.

## 6.7 Materials Falling into Excavations.

This hazard is due to materials and spoil being stored too close to the boundaries of an excavation, and either falling in due to improper or unsecured storage, or being accidentally knocked in by machinery or individuals.

## 6.8 People & Vehicles Falling into Excavations.

**These types of incidents occur due to:**

- No guarding or edge protection around the site of the excavation;
- No lighting around the excavation to ensure people can see where they are stepping;
- Traffic routes for vehicles being too close to the excavation site;
- Means of access such as ladders not being secured sufficiently and workers falling off into the excavation;
- No means of access, resulting in workers trying to lower themselves down into the excavation and falling;
- No - or insufficient - crossing points;
- Lack of signs detailing excavation area.

## 6.9 Collapse of Sides.

Excavations in cohesive soils, and in weak rock, may stand unsupported for periods ranging from 30 seconds to 30 days. However, they are not safe places to work as there is no way of knowing when excavations in ground of this nature will collapse, possibly with fatal consequences.

The sides of an excavation cannot be expected to hold up on their own without the use of support for the duration of the work.

Support is needed to prevent collapse and to ensure the safety of people in; and adjacent to the excavation.

**The following factors increase the risk of collapse of excavation sides:**

- Incorrect or insufficient supports;
- Plant and equipment being too close to the edge of the excavation;
- Vehicles operating too close to the excavation;
- Vehicles and certain types of machinery causing vibrations;
- Proximity to earlier excavations;
- Proximity of loaded foundations;
- Surcharging by spoil, stored materials or plant including vehicles;
- Damage to the support system by personnel, or when materials are lowered into the excavation;
- Undercutting of the road pavement structure or kerbs and gullies.

**Round type markedly affects the probability, timing, and the extent and nature of collapse:**

- Loose, uncomplicated, granular soils, i.e. sand or gravel, or mixtures containing them;
- Excavations through different strata, e.g. a weak layer lower down in an excavated face can undermine more stable layers above, such as layers of sand or gravel in otherwise stiff clays;
- The presence of groundwater, and the effect on the excavation sides from surface water running into the excavation;

- Made-up ground, such as loosely consolidated fill material, old refuse tips, etc;
- Loose blocks of fractured rock;
- Weathering, e.g. rain, drying out, freeze/thaw effects.

If the sides of an excavation collapse, it could be not only the soil but also the plant/equipment, vehicles and possibly other people operating close by that could fall onto workers in the excavation; crushing them and most likely causing their death.

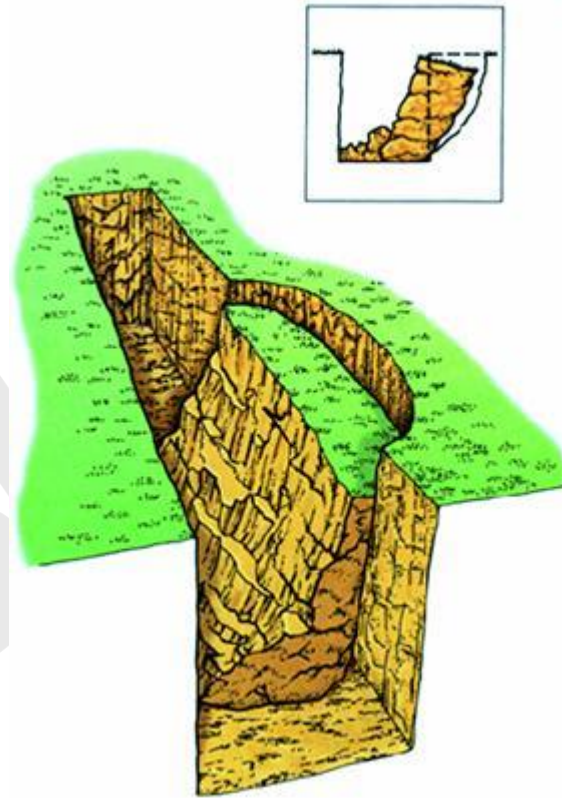


Figure 1.

#### 6.10 Undermining Nearby Structures.

Services or foundations of buildings can be undermined, disturbed or disrupted if an excavation is carried out too close to their proximity.

**An example of such undermining can be seen in the extract from the Health and Safety in Excavations, Be Safe and Shore document, HSG185 (no longer in print); seen below:**

A labourer suffered multiple fractures to his head and upper body when a 1.2m brick garden wall, situated immediately next to the trench he was excavating, collapsed. The trench was no more than 900mm in depth but the garden wall had very shallow foundations and had been completely undermined.





**Figure 1.**

Building foundations that are more likely to feel the effects of ground movement are those that are at a distance of less than two times the excavation depth from the face of the excavation, to prevent such structural damage, underpinning may be necessary.

Any lateral movement of the soil is likely to result in settlement of the surrounding ground, this settlement may be sufficient enough to damage adjacent buildings and services.

If excavations are not sufficiently backfilled, then further settlement could occur. Temporary supports should never be removed until there is sufficient backfill in place to prevent the sides of the excavation from collapsing.



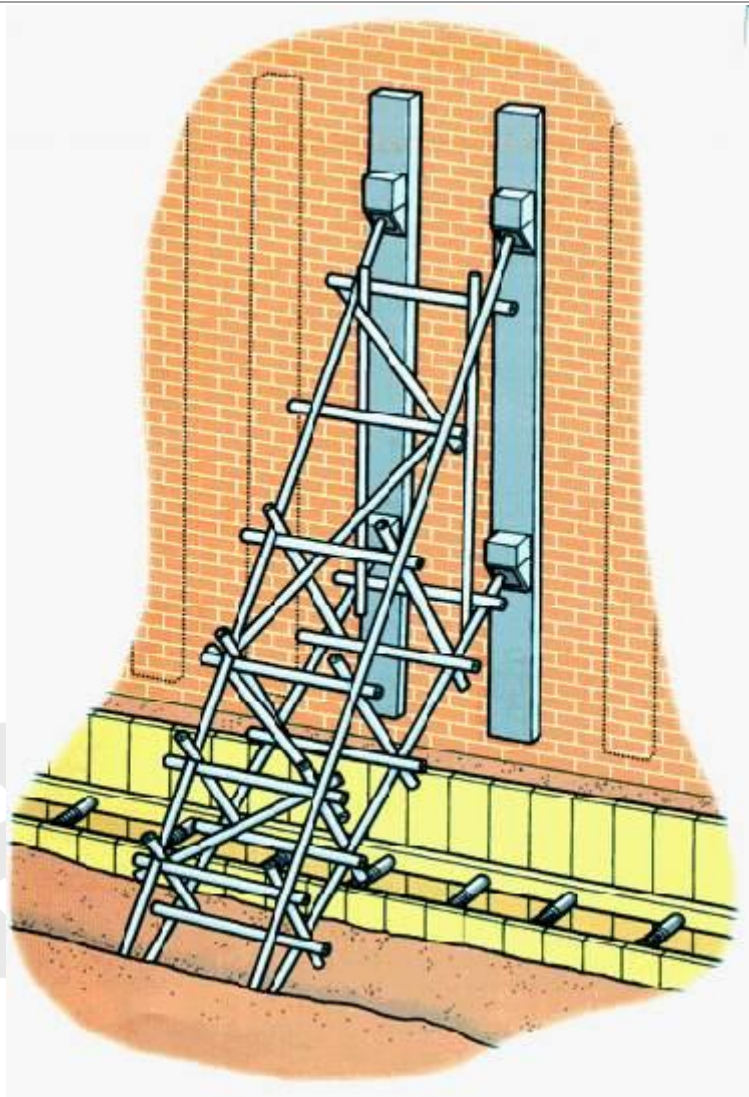


Figure 1.

### 6.11 Water Ingress.

**In excavations, the risk from the influx of water would be due to:**

- Hitting drains or water pipes;
- Heavy rainfall;
- Digging below the natural groundwater level.

Particular attention should be given to excavations close to rivers, lakes and the sea.

**The hazards arising from such an influx of water include:**

- Difficulty in escaping from deep excavations due to the combination of water and mud;
- Drowning;
- Instability of excavation sides and undermining of the support integrity.

Attention and care needs to be taken when considering pumping out water from excavations, as in some cases, this can lead to instability of the structure.

### 6.12 Contaminated Ground.

The land to be excavated should always be checked before work commences, as it may contain hazardous materials due to its previous use, which would be exposed by digging.

### 6.13 Toxic & Asphyxiating Atmospheres.

Toxic, asphyxiating and even explosive atmospheres can be found under certain conditions in excavations.

**The creation of such atmospheres could be due to:**

- The accidental hitting of gas or sewerage pipes;
- Contaminated ground upon which the excavation is situated;
- Contaminated materials seeping into the area from nearby;
- Deposits in the ground reacting with air or rainwater/groundwater.

**The presence of such atmospheres in the excavation can lead to:**

- Asphyxiation;
- Fire and explosion;
- Poisoning.

### 6.14 Mechanical Hazards.

Certain types of machinery give off fumes etc. which - when used in an excavation - can create an unbreathable atmosphere at the bottom, unless the necessary precautions are put in place.

Machinery, especially heavy types, have the potential to reduce the stability of the sides of the excavation if they are situated too close.

### 6.15 Excavation Controls/Precautions.

The following sections contain controls measures that can be used to reduce the risk to the workers undertaking tasks within or near to an excavation area.

These are only chosen examples and there may be many more different control measures available.

#### **Access.**

Provide good ladder access or other safe ways of getting in and out of the excavation. Ensure ladders are of good condition and are secured to prevent sliding. Ladders should be included on any inspection checklists. Ladders should extend above the top of the excavation by at least one metre.

Fence off all excavations in public places to prevent pedestrians and vehicles falling into them.

Where children might get onto a site out of hours, take precautions (e.g. backfilling or securely covering excavations) to reduce the chance of them being injured.

#### **Supervision.**

A competent person must supervise the installation, alteration or removal of excavation support.

People working in excavations should be given clear instructions on how to work safely.

### 6.16 Inspecting Excavations.

#### A competent person must inspect excavations:

- At the start of each shift, before work begins;
- After any event likely to have affected the strength or stability of the excavation; and
- After any accidental fall of rock, earth or other material.

A written report should be made after most inspections. Stop work if the inspection shows the excavation to be unsafe.

Although an excavation must be inspected at the start of every shift, only one report of such inspections is required every seven days.

Reports must be completed for all inspections carried out during this period for other purposes, e.g. after accidental fall of material.

#### Legal requirements:

- Health and Safety at Work etc. Act 1974.
- Management of Health and Safety at Work Regulations 1992.
- Provision and Use of Work Equipment Regulations 1992.
- CDM regulations 2007.

### 6.17 Unexploded Bombs (UXB).

The most likely source of unexploded bombs (UXB) and other ordnance (UXO) is from the thousands of devices dropped on major cities during the Second World War.

It is estimated that 10% of [high explosive](#) and as much as 50% of incendiary devices failed to explode.

These continue to present a potentially serious hazard to construction workers, property and third parties.

Brown field sites that were previously MoD land are also high risk locations, especially if they were used for training purposes.

Whilst these comprise the major areas of risk, UXO and UXB are found in the most unexpected places, such as beaches where ordnance is washed up following post-war dumping and the action of underwater currents and wave action over many years.

#### Prior to Starting Work.

When excavating, piling or drilling in inner city environments, particularly in areas that were subject to severe bombardment such as London, Coventry, Liverpool etc. it is recommended that a risk assessment be made at an early stage, before specialist contractors are on site, to establish the level of probability of UXO being present.

Maps are available from local authorities and commercial organisations showing the density of impacts for specific regions. These are largely produced from information gathered from bomb watching duties during WW2. This information should be available in the pre-tender Health & Safety Plan.

Particular problems will arise where underground lines are in proximity and prudent contractors are well advised to discuss these matters with the owners of the line during the tendering process.

If the site is in a high risk area, a qualified Explosive Ordnance Clearance (EOC) specialist should be employed to prepare the risk assessment and a method statement.

A surface geophysical [survey](#) using ground-penetrating radar can detect ordnance and other obstructions to a level of three metres which, if the ground is clear, will allow excavation down to that depth.

The radar can then be re-employed to examine a further 3 metres of depth, a process which is repeated until the required depth is reached. This is laborious but it is the safest method.

This process can cause particular difficulties if the [contractor](#) is anticipating working in an existing water course, e.g. driving piles or shafts in a river bed which would involve the construction of coffer dams. Ground-penetrating radar can operate from a boat and specialist contractors are available to carry out this function if required.

#### **Whilst Working the Site.**

After 60 or more years in the ground, bombs and other items of ordnance generally maintain their shape, but become very rusty and decayed. If a suspicious object that is similar in size and shape to a WW2 bomb is uncovered during the course of ground works, the emergency procedures should be put into effect.

#### **These would include:**

- Stopping work.
- Evacuating to a safe distance; this may be outside of the boundary of the site and could involve members of the public.
- Calling the police on 999 to notify the nearest bomb disposal unit.
- Ensuring nobody re-enters the area until told to do so by the authorities.
- On discovery of an item of ordnance or a suspect object, the location of the object should be marked, and the immediate area evacuated in relation to the size of the object. The object should not be touched or moved until it has been identified. If in any doubt call the police and they will call the bomb squad

### **6.18 Controls.**

#### **Lighting.**

During darkness, edges of excavation should be illuminated, especially where they are adjacent to public thoroughfares.

During the winter, or in deep excavations, shafts and tunnels, lighting will be necessary to enable operations to proceed safely.

Such lighting must be installed with equipment suitable for use in the excavation.

#### **Barriers/Edge Protection.**

Barriers should be put in place to prevent vehicles getting too close to the edge of excavations, causing

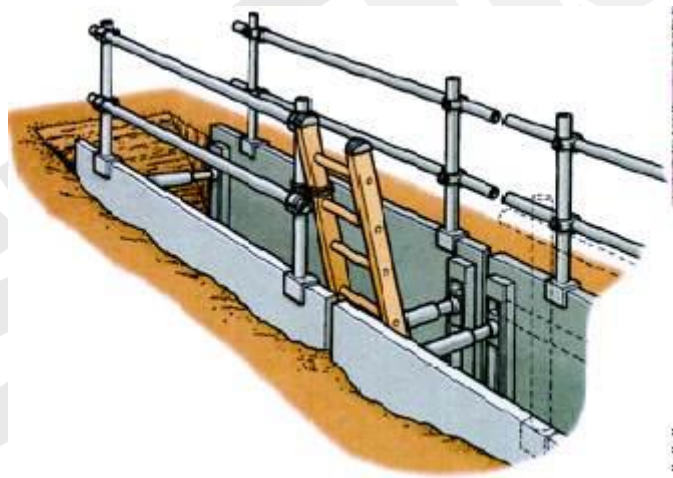
the sides to collapse and the vehicle to fall in.

The top of an excavation presents a fall risk to people close by. All excavations more than 2m deep should be provided with suitable barriers, USUALLY comprising guard and intermediate rails and toe boards.

Guard-rail assemblies can be fabricated which either connect to trench box sides and can be easily lifted on and off, or which can be inserted into the ground immediately next to the supported excavation side.

Where children might get onto a site out of hours, take precautions (e.g. backfilling or securely covering excavations/trenches) to reduce the chance of them being injured.

Barriers should be put in place to prevent vehicles getting too close to the edge of excavations, causing the sides to collapse and the vehicle to fall in.



### **Safe Access.**

Where children might get onto a site out of hours, take precautions (e.g. backfilling or securely covering excavations/trenches) to reduce the chance of them being injured.

### **Signs.**

Signs should be present around the perimeter warning of the excavation's presence.

Additional signs will be necessary for specific hazards as well as for the requirement for various types of personal protective equipment and/or special measures.

All signs used must conform to the Health and Safety (Signs and Signals) Regulations 1996 and must be explained and understood by all those working in the area.

### **Ventilation.**

Chemical hazards that may be encountered in excavation work include fumes or exhaust gases from equipment, which can collect and accumulate in excavations and pose serious hazards.

Excavations must be kept free from toxic or explosive gases and it must be remembered that any gases which are heavier than air will tend to settle in excavations.

The gases involved may be natural, like methane and sulphur dioxide, or they may arise from nearby internal combustion engines ([carbon monoxide](#)), leakage from liquefied petroleum gas equipment, or underground storage or from sewers.

In particular, petrol or diesel engines (generators or compressors) should never be used in or near



excavations unless proven effective arrangements are in place for the fumes to be ducted away safely.

One of the most effective methods of keeping the atmosphere healthy is to use ventilating equipment to blow clean air into the excavation, shaft or tunnel, in sufficient quantities to dissipate the foul atmosphere.

Tests must always be carried out in advance of work starting, and throughout the period of the work.

All persons working in an excavation should be instructed in escape and rescue procedures should an emergency arise.

This is particularly important where unhealthy atmospheres might arise. Instruction should be given on the use of rescue equipment (see Unit on Confined Spaces).

In deep excavations, particularly in areas such as river beds and estuaries, it may be necessary to use gas detection equipment to ensure that toxic or explosive levels of decomposition gases are not building up.

### 6.19 Damage to Underground Services.

It is essential, at the planning stage, to ensure that proper precautions are taken to avoid damage to underground services.

Underground services - gas, water and electricity - can be easily damaged during excavation work, leading to electrocution, fire, flooding and interruption of services to hospitals, offices and so on.

**Ideally, excavations should be kept away from existing underground services; these can be identified by a combination of:**

- 'Clues' provided by manhole covers, street lights etc.
- Cable and other service plans of the area;
- Detection devices (conventional detectors will miss plastic pipes)

In practice, excavations may have to be made in areas where there are known to be existing and/or disused services.

**Safe practices must be employed once the digging actually starts:**

- Watch carefully for evidence of previously unknown pipes or cables - check using the detection device.
- Dig trial holes by hand to confirm the position of pipes and cables - this is particularly important where plastic pipes are used.
- Dig by hand near buried pipes or cables, using spades and shovels rather than picks and forks.
- Treat all pipes and cables as live unless known otherwise.
- Report any suspected damage to services.
- Ensure there is an emergency plan to deal with damage to cables or pipes.
- Update service plans for the benefit of those in the future.

Look around for obvious signs of underground services, e.g. valve covers or patching of the road surface. Use locators to trace any services. Mark the ground accordingly.

Make sure that the person supervising excavation work has service plans and knows how to use them. Everyone carrying out the work should know about safe digging practices and emergency procedures.



## 6.20 Sewage.

Work activities may bring you into contact with sewage products. These products may make you ill. Illness is usually mild gastroenteritis; however, there is a risk of developing a more serious disease. It is a failing that most illnesses go unreported.

You could become ill by coming into contact with micro-organisms present in the sewage.



Figure 1.

### What are the health risks?

- Gastroenteritis.
- Weil's disease (Leptospirosis).
- Hepatitis.
- [Asthma](#).
- Skin/Eye infections.
- Inflammation of the lungs.

### How you become infected:

- Hand-to-mouth contact, eating, drinking, wiping the face with contaminated gloves.
- Cuts, scratches or wounds and some organisms entering the body through the eyes, either as dust or [mist](#).

### Are you at risk?

- On site at a water treatment works.
- On a site with a high rat population.
- On a site near portable toilets.
- On a site near fresh water.
- Handling sewage equipment in the works.
- Animal urine - particularly rats.
- All freshwater courses.
- Dead animals - small rodents & birds.
- Soil where animals have been.
- Most likely in warm weather.

### Protecting yourself.

- Understand the risks.
- Understand how you may be infected.
- Wear protective clothing.
- Avoid sewage if possible.
- Apply good personal hygiene.

- Cleanse all wounds & cover.
- Change out of contaminated clothing.
- Clean equipment & boots etc. on site.

In many cases, particularly in areas that are or have been occupied, you are at risk from sewage where you are excavating. Care should always be taken.

## 6.21 Excavation Controls.

### Safe Digging.

When it is suspected that underground services may be present, the method of digging should be altered.

This would mean a change from equipment such as excavators, diggers, and picks to hand tools such as shovels and spades.

The style of digging will also need to change as heavy sudden blows with spades etc. may damage the services. Hand tools must be used in combination with light blows to ensure as little damage is caused as possible should the underground services still be struck.

### Crossing Points.

These are pre-determined points placed along the excavation in order to cross from one side to the other.

These crossing points should be of adequate width and strength to support the workers and equipment likely to be using them.

Guard rails and toe boards should be provided to prevent people and materials accidentally falling into the excavation.

Workers should be made aware of these crossing points and informed that they must be used. Having crossing points at regular intervals along the excavation will ensure that workers use them instead of trying to find alternative means of crossing.

### De-Watering.

If the ground is suitable, one of several ground de-watering techniques may be used. Such methods involve either shallow well pumping or well pointing. In either case, the pumping out of water has the effect of lowering the ground water table to a level below that to which the excavation is to be taken.

Wells or well pointing, for their successful use, require a proper soil analysis to make sure that the method is feasible. It must also be established, at the same time, that no fine material will be drawn from underneath adjacent property with consequent risk of settlement.

The risk assessment should determine the likelihood of water ingress and the prevention measures should also be considered at that stage. If water ingress is likely, this will have the ability to undermine the walls and supports, so the right type of support must be selected.

## 6.22 Traffic Routes.

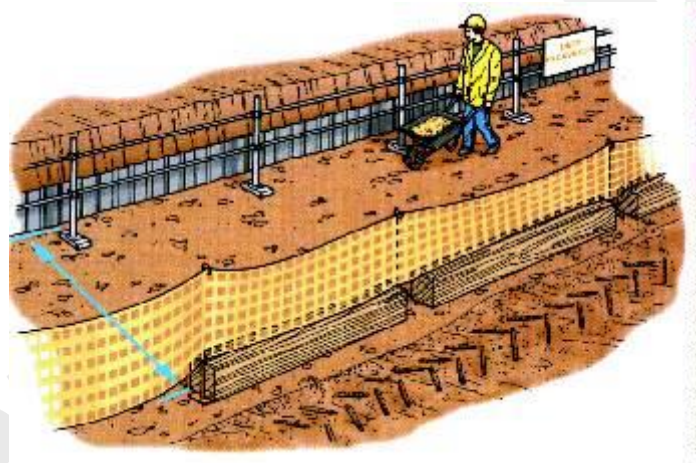
Vehicles operating too close to the edge of an excavation have the possibility of causing the sides to collapse and they can also fall in. This is why routes for vehicles should always be carefully planned so that traffic does not have to approach close to the edge of the excavation.

Traffic routes should be designated and their location easily identified and clearly marked, for instance

with baulks of timber and/or fencing.

Vehicles must be kept away from the excavation unless they have to approach for the purposes of material delivery and removal; in such situations, they must use approved routes, which will bear their weight. Stop blocks will be required to prevent over-running into the excavation and accidental overrunning.

Pedestrian routes should be barriered and guard rails and toe boarding provided.



**Figure 1. Barriered Pedestrian Routes.**

### **6.23 Storage and PPE.**

#### **Location of Machinery & Materials.**

Materials and equipment should not be stored too close to the edge and where they are stored, it is good practice to have materials secured to prevent them being accidentally knocked into the excavation.

When it is necessary to have machinery or materials close to the edge for ease of working, it must be ensured that the weight of these items is not so great as to cause collapse of the excavation sides.

Guard rails and toe boarding should be present to prevent items being accidentally knocked into the excavation.

#### **Storage of Spoil.**

Spoil, like machinery and material, should not be stored too close to the edge of the excavation.

It should generally be stored at least 1.5m from the edge. However, if the depth of the excavation exceeds 1.5m then the spoil needs to be stored at a distance that equals the depth of the excavation.

In order to prevent the accidental influx of spoil into the excavation, edge protection should be provided - in the form of toe boards, projecting trench sheets or box sides.

#### **Personal Protective Equipment.**

**Depending on the nature of the work to be carried out, the following are types of personal protective equipment that may be necessary:**

- Hard hats - to protect from falling materials.
- Safety harnesses.
- Cold weather wear.

- Gloves.
- [Breathing apparatus](#).
- Safety footwear.
- [Hearing protection](#) - if using noisy equipment.

Additional PPE may be required depending on the task involved.

**All PPE used should be:**

- Correct for the task.
- In good condition.
- Checked before use.
- Stored safely when not in use.

Any faulty or damaged equipment should be immediately reported to the relevant person on site and should not be used. No tasks should be performed if the correct personal protective equipment is not present.

## 6.24 Permit to Work (PTW).

Permits to Work (PTW) or Work Permits are not difficult to understand in practice. However, getting it wrong can have catastrophic effects.

PTW are exactly what they say; permission has to be gained to undertake a task or gain entrance to a particular area or item of plant.

PTW do not normally give instructions on how the task of repair or entry or maintenance should be undertaken. Rather, they are a way of making the task less of a risk by using a method of specified procedures to be followed with respect to one or more of the hazards associated with the task.

In simple terms, PTW are used to ensure that equipment, electrical or other, is switched off and isolated before the maintenance work begins and that the equipment remains isolated for the duration of the work or that entry to a hazardous - or potentially hazardous - area is controlled.

**The key elements in PTW are:**

- 1. A clear statement of the aims of the PTW and what is to be achieved.
- 2. The steps to be taken before PTW is issued and the arrangements of the PTW.
- 3. The steps to be taken while the PTW is in force
- 4. The steps to be taken when the PTW is being withdrawn, either temporarily or permanently.

**Work in environments which present considerable health hazards:**

- [Radiation](#) work.
- Conditions of severe thermal stress - repair work in kilns, food freezer storage systems.
- Work involving toxic dusts (asbestos), gases and vapours (often in confined spaces).
- Lone working.

**Aims of the PTW:**

- Gaining written permission to carry out a task. In real terms, a [permit to work](#) is a formal written system covering all aspects of the work to be undertaken with signed authority required for the

various activities to take place. Every aspect of the work is planned, overseen, checked and recorded and when the time comes, is confirmed as having been completed satisfactorily.

- Proving a procedure to carry out a risk assessment prior to carrying out a high risk task.
- Providing a procedure to ensure that essential controls remain in place.
- Proving a procedure to ensure that things are returned to a safe state on completion of the task.
- Providing a means of adequate [communication](#) for those managing and undertaking the task.

### Issuing the PTW:

- The PTW must state what work is to be undertaken, but may not need to detail how it will be done.
- The PTW must detail where the work is to be done.
- The PTW also states when the work has to be done. Tasks may be required to be undertaken in a particular order to ensure safety at all times.
- The PTW must indicate the hazards associated with the work and risk which may be involved.
- The [risk control](#) measures.

PTW are an essential part of safety practice. However, they are only effective if the procedure is followed. They may be supported by Safety Rules; the rules should support the PTW and not contradict it.

As we have said, a Permit to Work system is a formal written system used to control certain types of works which have been identified as having special risk. It is also a means of communication between those who direct work (broadly management/supervisors), those who have to work in the dangerous area/undertake the dangerous high risk activities and those who need to take particular notice of the work so that their actions do not endanger others.

The Permit authorises certain named people to do certain things, at a certain time, and sets out the main precautions needed to complete the work safely. Sometimes, this is augmented by a detailed method statement.

The Permit to Work reassures those about to undertake the task that the work will be kept safe, and tells others the actions they ought to take (or perhaps what actions not to take).

To achieve this, any Permit system has to be flexible (to take account of possible variable nature of the work) but remain a truly effective control.

**The design of a Permit to Work system can be complex, and rarely does the Permit 'stand alone':** it is usually accompanied by a local guidance document that explains the way in which the system is meant to operate.

The following checklist will help those designing or preparing a Permit to Work system to decide whether they have covered all the essential points.

**If the answer to any point is 'no', then you should ask whether the absence of this feature in the system will compromise anyone's safety:**

- Does the Permit cover all the relevant legal requirements?
- Does the Permit clearly define the limits of the work and the location concerned?
- Does the Permit procedure extend to contractors and their employees?
- Is compliance with the Permit procedure understood by all involved as being essential for certain types of work?
- Is it clearly laid down who has the authority to issue Permits?
- Have personnel who issue Permits been formally authorised and received suitable training?
- Do Permits clearly specify to whom they are issued?
- Does the recipient have to sign the Permit to show that he/she has both read the permit and understood the conditions laid down in it?
- Does the procedure provide both for the recipient to retain the Permit, and for a record of live



permits to be maintained at the point of issue?

- Does the system stipulate where 'live' Permits must be displayed?
- Do Permits specify clearly a time limit for expiry or renewal?
- Do Permits specify clearly the plant or geographical location to which the work must be limited?
- Does the system ensure that the person in charge of the work is aware of all work controlled by Permits that is proceeding within his/her area of responsibility?
- Does the Permit procedure include a hand-over mechanism for work that extends beyond a shift or work period?
- Is a hand-back signature required when the activity is complete?
- Does the system show how the effectiveness of the procedures will be monitored?
- How will the effectiveness of the system be reviewed?

It is important that one activity authorised under a Permit to Work system does not create danger for another.

Those who authorise the issue of Permits should be aware of potential interactions, and should ensure that when a Permit is issued it takes account of; and does not [conflict](#) with, other permits or works.



Figure 1.

### 6.25 Excavation Support.

Where an excavation has to be provided with a suitable form of support, the system and the method to be adopted for the excavation cannot be considered individually, in [isolation](#).

Each will inevitably react on the other and persons dealing with the temporary support must maintain close liaison with whoever is making decisions on the plant to be used.

Such liaison is particularly important in drainage work, when long pipes or large pre-cast manhole rings may have to be lifted through any supporting struts etc.

### 6.26 Basic Principles of Support.

There are many ways by which excavations can be made safe to work in, avoid settlement to adjacent land and buildings and allow work to proceed with minimum hindrance.

**There are, however, only four fundamental principles involved:**

**Battered sides:**



This is probably the safest method and accidents resulting from the collapse of properly designed and executed battered systems are rare. Almost all soils can be excavated to a safe batter, provided that sufficient space is available (i.e. the batter will not affect adjacent buildings, etc.) and a safe angle of response is known and adhered to.

Where waterlogged ground is involved, specialist advice should be taken, as some system of ground de-watering will be needed to improve stability. Only tests can show whether or not the ground is capable of being de-watered.

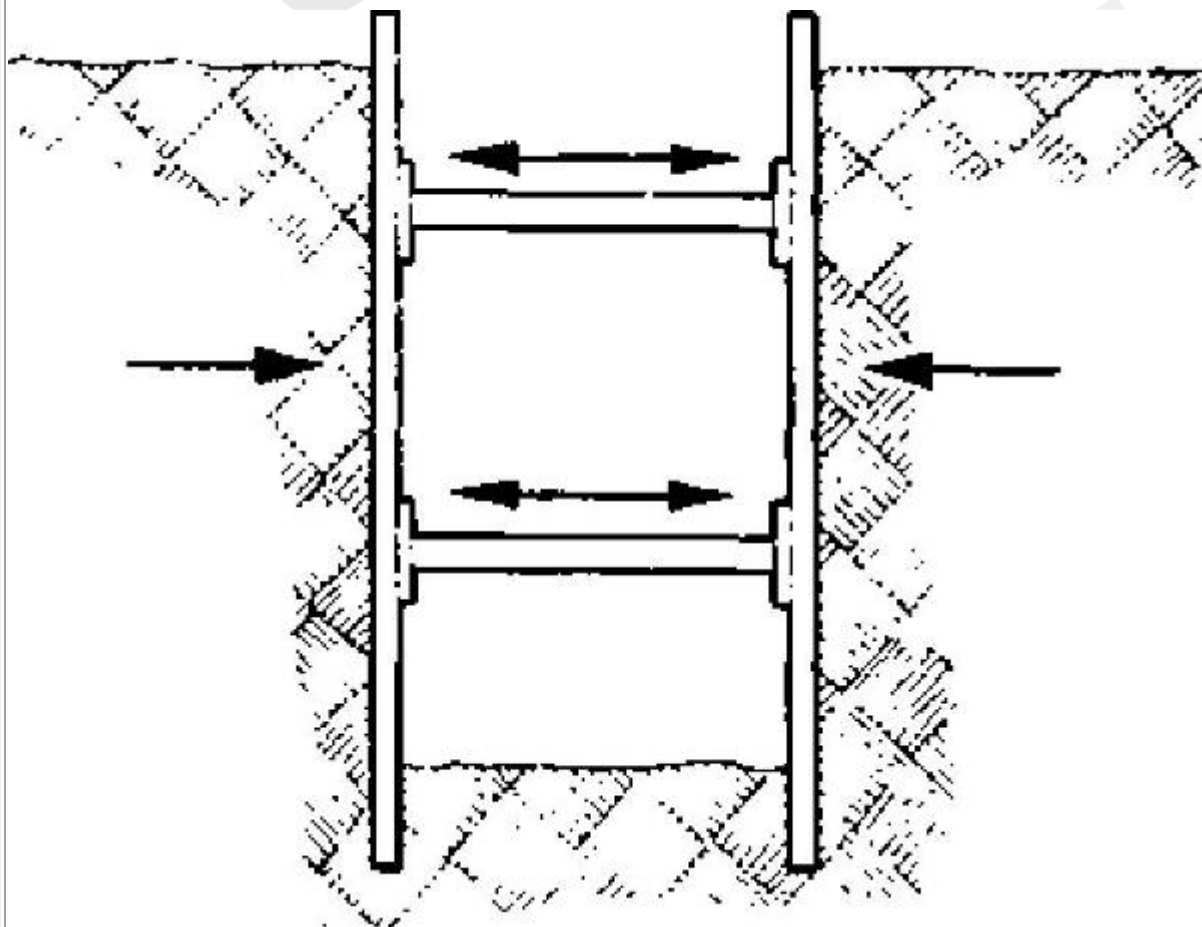
Surface water can seriously affect the stability of battered slopes. Where such flow is likely to happen in wet conditions, interceptor trenches, to cut off surface water and lead it away from the excavation, should be provided.

### **Double sided support:**

With this method of support, the forces exerted by the earth are transmitted from one side of the excavation to the other by walings and horizontal struts, i.e. the forces imposed by the earth on the supporting materials are resisted by the earth on the opposite side of the excavation. Hence, if the support is adequately designed, a state of equilibrium is maintained between the two sides.

Of methods using a form of structural support, this is the most satisfactory, as only horizontal forces are involved. The method lends itself to the use of pre-designed ("*Standard*") solutions and proprietary systems, which are installed in accordance with manufacturers' tables provided.

In saturated silt and sand, where de-watering is not being used, there is a serious risk of the bottom of the trench '*boiling*' upwards. If this happens, total collapse of the support system results. In such conditions, therefore, standard solutions must in no circumstances be used. The penetration of the sheeting is a key factor in the safety of the support, which requires design by a competent person.



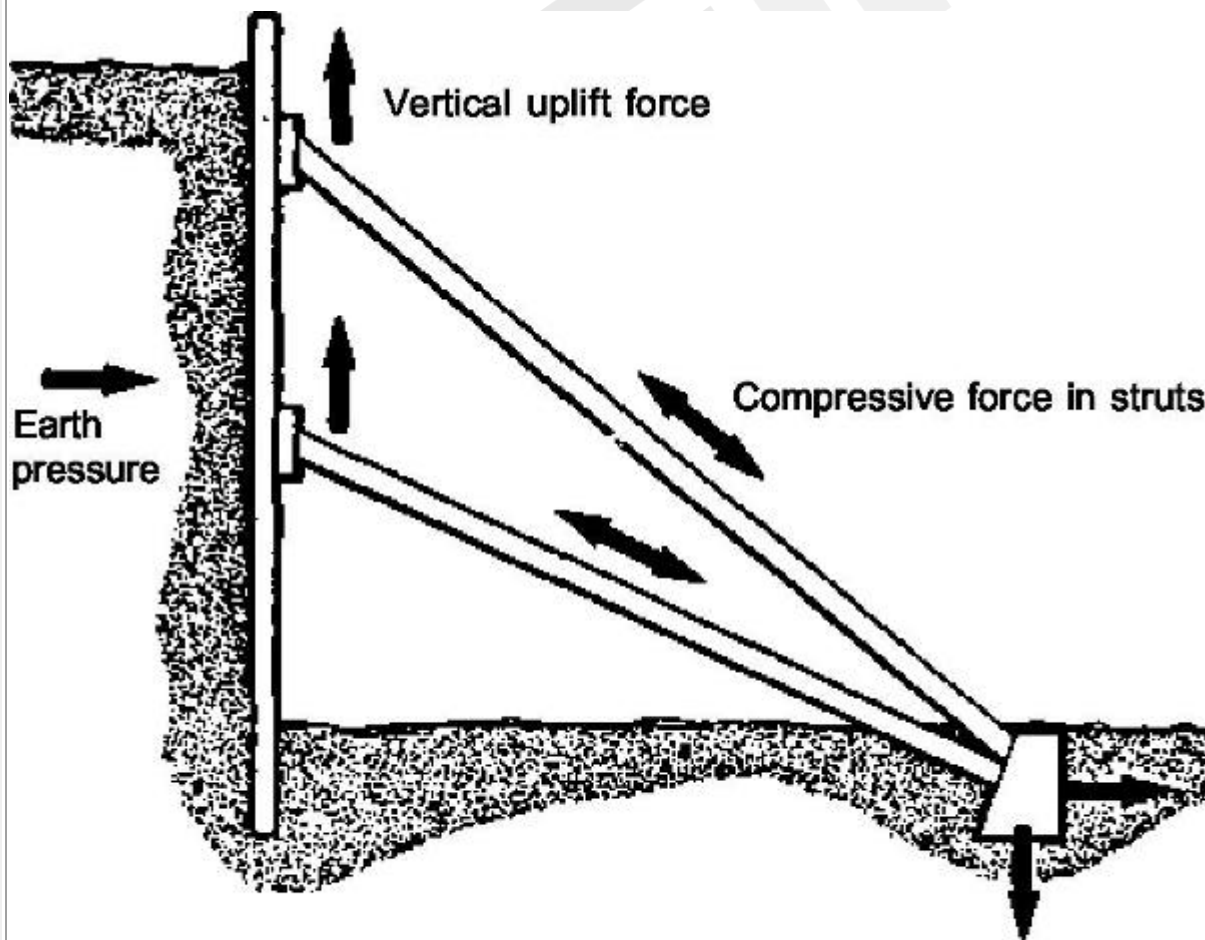
**Figure 1.**

Penetration must be adequate to avoid "boils" or "blows" and determined by a competent temporary works [designer](#).

**Single sided with raking support:**

Only one face of the excavation is involved. Earth pressure from the excavated face is resisted by transferring the load through the support material via walings to either raking shores or ground anchors. In the raking shore approach, an adequate foundation is needed to transfer the loads involved to the unexcavated ground.

When raking shores are used to resist horizontal forces, the load in the raking member is greater than the horizontal load and a vertical uplift force is introduced into the support system. The design for this type of support must, therefore, allow for sufficient toeing-in of the sheeting to resist these upward forces, as must the design of the connections between strut, waling and sheeting.



## *Raking support*

**Figure 1. Ranking Support.**

**Standard or designed solutions:**

In the majority of cases, the support of excavations is carried out by on site "*Standard Solutions*", without recourse to special design. The advent of proprietary equipment has greatly increased the scope for such methods. The support of some excavations, however, will require detailed design work by competent persons.

**Standard solutions.**

It is essential that clear parameters are established in the adoption and use of standard solutions.

**The use of standard solutions should be applied only in the following circumstances:**

- Double-sided, narrow trench support, not exceeding 6m deep in non-water bearing ground.
- Shallow pits, not exceeding 6m deep.
- Where water problems have been eliminated by other means, e.g. well pointing, and the excavation is within the limitations of the above.
- When an unsupported trench, not exceeding 6m deep, is feasible.

**When adopting the standard solution approach, these points need to be followed:**

- When deciding the safe batter of an excavation, proper account must be taken of the ground conditions.
- Where support is provided, the method must comply with recognised good practice in all details.
- Where proprietary systems are used, installation must be strictly in accordance with manufacturers' instructions.
- The system of work to be adopted must be explained in detail to the persons engaged in placing or removing supports, and others who will be working in the excavation.
- If possible, the system of work should be illustrated with drawings or sketches, or with suitable proprietary literature, together with check lists.
- The method of work and instructions and sketches provided must be strictly adhered to.
- Specialist advice should be sought if there are any doubts as to the safety and sufficiency of the support system.

## 6.27 Systems of Support.

Within the basic principles of support, a variety of materials and methods may be used.

### Steel Trench Sheet piling.



### Figure 1. Steel Trench Sheeting.

Trench sheeting has the advantage of easy driving in poor ground, prior to an excavation being commenced.

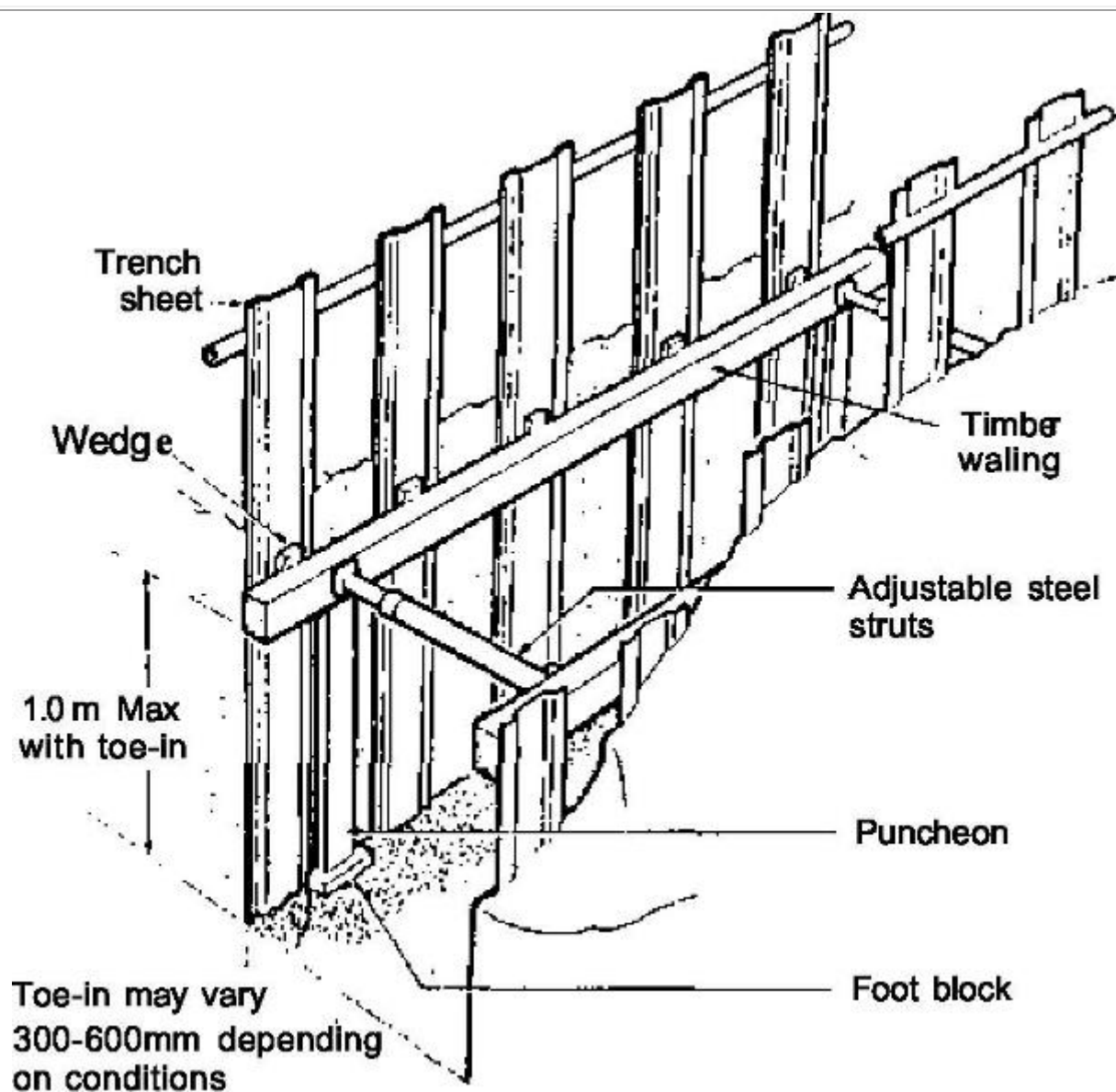
In stiffer ground, it can be part driven initially, then further driven as the excavation proceeds.

Obtainable in a variety of sectional stiffnesses, sheet piling is interlocking and, being much stiffer than trench sheeting, it can be pre-driven to much greater depths before any excavation is started.

Sheet piling is expensive in the cost of driving and in its subsequent extraction.

**However, its use has the following advantages:**

- By pre-driving, the main structural support is in place before any excavation is started.
- The interlocking is reasonably watertight, making its use ideal where waterlogged or very unstable ground is to be supported.
- Because of its structural strength, steel sheet piling can be used for any of the basic principles of support. It is the only really satisfactory material where a cantilever support is used.
- Where impermeable conditions exist below a waterlogged stratum, sheet piling can be used to '*cut-off*' the water bearing layer from the excavation. Where no cut-off is economically possible and wet, non-cohesive material is to be supported, the design of the piling must allow sufficient penetration to avoid the bottom of the excavation heaving or '*boiling*'.
- In all cases where steel sheet piling is the proposed solution, calculations should be made by a competent person



**Figure 1. Sheet Piling.**

### **6.28 Hydraulic Struts/Walings.**

The objective is to provide a strut/waling assembly which can be lowered into the trench and hydraulically stressed against the sheeting without anyone entering the trench.

Such systems are normally only suitable for the support of trenches up to 6m deep.



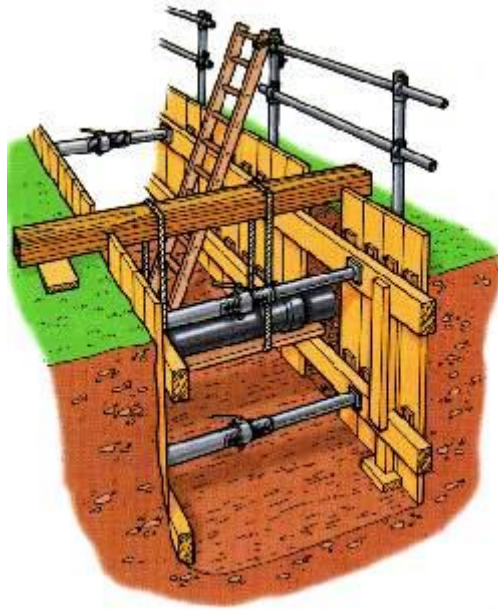


Figure 1.

### 6.29 Proprietary Systems.

The use of proprietary ground support systems offers advantages over traditional systems.

**Such advantages include:**

- The ease and improved safety of installation: operatives can install most proprietary ground support systems without the need to enter the excavation;
- Systems are available to suit a wide range of applications;
- Increased working space for ease of excavation and pipe laying;
- The availability of technical advice on selection, installation and use.

Proprietary ground support equipment always needs to be installed, removed and stored when not in use in accordance with the manufacturer's instructions.

**MANHOLE SHORES** are four-sided adjustable frames with integral hydraulic rams and are intended for supporting excavations for manholes, foundations, small tanks and pits and similar structures.





**Figure 1. Waling Frames.**

Waling frames and manhole shores should be supplied complete with chains or other means by which they can be hung from the sheeting or from other frames.

#### **Safe use of proprietary systems.**

##### **When using proprietary ground support systems always:**

- Ensure that workers stay inside the protected area;
- Obtain and follow the manufacturer's instructions for installation and use;
- Train and supervise the people who will use the equipment;
- Use the correct tools for connecting and disconnecting hydraulic hoses and releasing hydraulic pressure in the rams;
- Inspect the equipment before taking it into use;
- Ensure all hydraulic components are pressurised to the manufacturer's recommended working pressure;
- Ensure that the supporting chains or slings are properly used;
- Use additional equipment if required for stop-end protection;
- Regularly inspect the installation and in particular its hydraulic system, if any, and carry out remedial or maintenance work to the system in use;
- Take care that equipment is not damaged by plant or by rough handling and replace any that is damaged, using only parts that are approved by the manufacturer;
- Clean, inspect and maintain the equipment following use and store in a stable manner.

### **6.30 Main Hazards & Controls Relating to Construction & Demolition.**

Construction is a dangerous industry. Each year, thousands are killed world-wide, and many thousands more are injured, some suffering [disability](#) for the rest of their lives.

#### **The most frequent causes of accidental death and injury are:**

- **Falls:** People fall because access to and from the workplace is not adequate, or the workplace itself is not safe. The importance of providing good access to a safe working position (e.g. a platform with toe boards and guard rails) cannot be over-emphasised.

- **Mobile plant:** Construction plant can be heavy. It often operates on ground which is muddy and uneven, and where driver visibility is poor. People walking on site are injured or killed by moving vehicles, especially reversing ones. Others, particularly drivers and operators, are killed or injured by overturning vehicles and plant.
- **Falling material and collapses:** People are struck by material falling from loads being lifted and material that rolls or is kicked off work platforms; others are struck or buried by falling materials when excavations, buildings or structures collapse. Structural collapses can range from walls, which fall because their foundations are undermined by nearby excavations, to buildings, which collapse during alteration works because the structure was weakened and/or overloaded. Structures can also collapse unexpectedly during demolition if action is not taken to prevent instability. Scaffolds collapse because ties are either forgotten or removed too early during striking, or the scaffold is overloaded. Structures under construction may also collapse, e.g. steel frames that have not been adequately braced, or formwork that is prematurely loaded.
- **Electrical accidents:** People suffer [electric shock](#) and burns when they use unsafe equipment and when they contact overhead power lines and buried cables.
- **Trips:** Trips are the most common cause of reported injuries on construction sites, with over 1000 major injuries each year. Most of these can be easily avoided by effective management of access routes such as corridors, stairwells and footpaths.

#### Question 1.

Which statement is true? Ladders should be sited at: -

#### Multiple Choice (HP)

Answer 1: 45 degrees

Response 1:

Jump 1: This page

Answer 2: 65 degrees

Response 2:

Jump 2: This page

Answer 3: 75 degrees

Response 3:

Jump 3: Next page

Answer 4: As steep as possible

Response 4:

Jump 4:	This page
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### Question 2.

Which of the following is typically NOT a common hazard on construction sites?

#### Multiple Choice (HP)

Answer 1:	falling material and collapses
Response 1:	
Jump 1:	This page
Answer 2:	mobile plant
Response 2:	
Jump 2:	This page
Answer 3:	manual handling
Response 3:	
Jump 3:	This page
Answer 4:	drowning
Response 4:	
Jump 4:	Next page

### Question 3.

The safe erection of the scaffold depends upon certain factors, which of the following is true:

#### Multiple Choice (HP)

Answer 1:	The strength and stability of any surface upon which it is placed
Response 1:	
Jump 1:	This page
Answer 2:	The stability of any structure to which the scaffold is secured
Response 2:	

Jump 2:	This page
Answer 3:	The integral strength achieved by all the component parts, e.g. ledgers, bracing, etc.
Response 3:	
Jump 3:	This page
Answer 4:	The safety of the working platform that shall not be less than 600mm wide.
Response 4:	
Jump 4:	This page
Answer 5:	All of these
Response 5:	
Jump 5:	Next page

## 1.5 - Construction Hazards and Control.

All occupations are at risk from injuries on construction sites, irrespective of their skills, due to the amount of activities taking place simultaneously. Hazards associated with working at height include falls; this is the largest single cause of accidents and accounts for the highest number of fatalities.

Unsteady structures can collapse and crush the workers who were on it and anyone else around it. The erection of a perimeter scaffold prior to that of the structure itself is a safety measure used for a variety of structures ranging from pre-cast concrete to timber frame.

Every pedestrian on site is at risk, whether they are a worker or a member of the public. Vehicle traffic on a site can lead to people being struck either by a moving vehicle or injured by a load coming off a forklift truck, for example. Careful planning of the traffic routes on the site will also prevent many other accidents.

The risk of overturning of equipment or plant, such as ride-on rollers or forklift trucks among others, has been addressed; they now require the provision of a **Roll Over Protection System (ROPS)**.

The use of powered tools can lead to electrocution if they are not properly tested or the electrical supply used is faulty. The risk of coming into contact with either overhead cables, directly or via tools; or underground cables is largely overlooked.

Working over or near water has its own unique hazards such as drowning or coming into contact with water contaminated by urine causing Weil's disease. Emergency procedures for rescue need to be well rehearsed through drills prior to undertaking the work.

### 1.5.1 - Scope of Construction.

#### Introduction.

The scope of construction is wide, ranging from new build on brown-field sites to maintenance and repairs of all types of premises, domestic, factories, power stations, offices, sports facilities etc.

We have started here because you need to understand the scope of construction activities and the hazards of this work.

**Consider what types of work activities are involved within the construction industry:**

- Site surveying.
- Clearing land.
- Demolition, including using explosives.
- Excavation.
- Tunnelling.
- Ground work, hand digging, laying of pipes and concrete.
- Scaffolding, tower systems and access equipment.
- Manual handling of bricks, timber, steel, concrete blocks and materials.
- Working at heights.
- Working below ground.
- Working in confined spaces.
- Driving and using plant and equipment.
- Maintenance work and repair.
- Hot work, burning, plumbing, cutting, welding.
- Working over deep water.
- Using hand tools.
- Using power tools.
- Using vibrating tools.
- Working with substances, painting, sealing, treating, asbestos.

The list of activities is long. In most cases, it is hard physical work and it can be indoors or outdoors, working in cold and hot environments and exposed to the elements of weather.

We will now [group](#) the hazards of such work. NEBOSH will expect you to recall these main hazards.

**The most common causes of accidents involve:**

- Falls;
- Falling material and collapses;
- Electrical shock and burns;
- Mobile plant;
- Manual handling.

**Definition of the term '*construction*'.**

**ILO Safety and Health in Construction Convention C167.  
Article 2.**

**For the purpose of this Convention.**

- **(a) The term construction covers:**
  - (i). Building, including excavation and the construction, structural alteration, renovation, repair, maintenance (including cleaning and painting) and demolition of all types of Buildings or structures;
  - (ii). Civil engineering, including excavation and the construction, structural alteration, repair, maintenance and demolition of, for example, airports, docks, harbours, inland waterways, dams, river and avalanche and sea defence works, roads and highways, railways, bridges, tunnels, viaducts and works related to the provision of services such as communications,



- drainage, sewerage, water and energy supplies;
- (iii). The erection and dismantling of prefabricated buildings and structures, as well as the manufacturing of prefabricated elements on the construction site

### 1.5.2 - Safe Stacking and Storage of Materials and Flammable Substances.

Due to the changing nature of construction sites and activities it is important to ensure that materials and flammable substances are safely stacked and stored.

This is discussed further in [Element 7](#): Chemical and Biological Health Hazards and Risk Control.

### 1.5.4 - ILO CONVENTION C167 AND RECOMMENDATION R175.

#### ILO CONVENTION C167 AND RECOMMENDATION R175.

##### ILO Safety and Health in Construction Convention, 1988 (No. 167).

The convention provides for detailed technical preventive and protective measures having due regard for the specific requirements of the construction sector. These measures relate to safety of workplaces, machines and equipment used, work at heights and work executed in compressed air. The Convention applies to all construction activities, namely building, civil engineering, and erection and dismantling work, including any process, operation or transport on a construction site, from the preparation of the site to the completion of the project. It states an internationally agreed basis of legal requirements that should give effect to good occupational safety and health practices and procedures.

**ILO Safety and Health in Construction Recommendation R175** adds some important recommendations for further action.

### 1.5.5 - ILO Safety and Health in Construction Recommendation R175.

On the 20th June 1988, the following Recommendation from the General Conference of the [International Labour Organisation](#) at Geneva, having determined that these proposals shall take the form of a Recommendation supplementing the Safety and Health in Construction Convention, which may be cited as the **Safety and Health in Construction Recommendation, 1988**:

#### I. Scope and Definitions.

- **1. The provisions of the Safety and Health in Construction Convention, 1988, hereinafter referred to as the Convention and of this Recommendation should be applied in particular to:**
  - (a). Building, civil engineering and the erection and dismantling of prefabricated buildings and structures, as defined in **Article 2(a)** of the Convention;
  - (b). The fabrication and erection of oil rigs, and of offshore installations while under construction on shore.
- **2. For the purposes of this Recommendation.**
  - **(a). The term construction covers:**
    - (i). Building, including excavation and the construction, structural alteration,

- renovation, repair, maintenance (including cleaning and painting) and demolition of all types of buildings or structures;
- (ii). Civil engineering, including excavation and the construction, structural alteration, repair, maintenance and demolition of, for example, airports, docks, harbours, inland waterways, dams, river and avalanche and sea defence works, roads and highways, railways, bridges, tunnels, viaducts and works related to the provision of services such as communications, drainage, sewerage, water and energy supplies;
- (iii). The erection and dismantling of prefabricated buildings and structures, as well as the manufacturing of prefabricated elements on the construction site;
- (b). The term construction site means any site at which any of the processes or operations described in clause (a) above are carried on;
- (c). The term workplace means all places where workers need to be or to go by reason of their work and which are under the control of an employer as defined in clause (f) below;
- (d). The term worker means any person engaged in construction;
- (e). The term workers' representatives means persons who are recognised as such under national law or practice;
- (f). The term employer means:
  - (i). Any physical or legal person who employs one or more workers on a construction site; and
  - (ii). As the context requires, the principal contractor, the contractor or the subcontractor;
- (g). The term competent person means a person possessing adequate qualifications, such as suitable training and sufficient knowledge, experience and skill for the safe performance of the specific work. The competent authorities may define appropriate criteria for the designation of such persons and may determine the duties to be assigned to them;
- (h). The term scaffold means any temporary structure, fixed, suspended or mobile, and its supporting components which is used for supporting workers and materials or to gain access to any such structure, and which is not a "*lifting appliance*" as defined in clause (i) below;
- (i). The term lifting appliance means any stationary or mobile appliance used for raising or lowering persons or loads;
- (j). The term lifting gear means any gear or tackle by means of which a load can be attached to a lifting appliance but which does not form an integral part of the appliance or load.

### 1.5.6 - General Provisions.

3. The provisions of this Recommendation should also apply to such self-employed persons as may be specified by national laws or regulations.

## II. General Provisions.

- 4. National laws or regulations should require that employers and self-employed persons have a general duty to provide a safe and healthy workplace and to comply with the prescribed safety and health measures.
- 5.
  - (1) Whenever two or more employers undertake activities at one construction site, they should have the duty to co-operate with one another as well as with any other persons participating in the construction work being undertaken, including the owner or his representative, in order to comply with the prescribed safety and health measures.
  - (2) Ultimate responsibility for the co-ordination of safety and health measures on the construction site should rest with the principal contractor or such other person as is primarily responsible for the execution of the work.

- **6.** The measures to be taken to ensure that there is organised [co-operation](#) between employers and workers to promote safety and health at construction sites should be prescribed by national laws or regulations or by the competent authority.

**Such measures should include:**

- **(a)** The establishment of safety and health committees representative of employers and workers with such powers and duties as may be prescribed;
- **(b)** The election or appointment of workers' safety delegates with such powers and duties as may be prescribed;
- **(c)** The appointment by the employer of suitably qualified and experienced persons to promote safety and health;
- **(d)** The training of safety delegates and safety committee members.
- **7.** Those concerned with the design and planning of a construction project should take into account the safety and health of the construction workers in accordance with national laws, regulations and practice.
- **8.** The design of construction equipment, tools, protective equipment and other similar equipment should take account of ergonomic principles

### 1.5.7 - R175: Preventative and Protective Measures.

#### III. Preventative and Protective Measures.

- **9. Construction work should be planned, prepared and undertaken in such a way that:**
  - (a). Risks liable to arise at the workplace are prevented as soon as possible;
  - (b). Excessively or unnecessarily strenuous work positions and movements are avoided;
  - (c). Organisation of work takes into account the safety and health of workers;
  - (d). Materials and products are used which are suitable from a safety and health point of view;
  - (e). Working methods are employed which protect workers against the harmful effects of chemical, physical and biological agents.
- **10.** National laws or regulations should provide for the notification to the competent authority of construction sites of such size, duration or characteristics as may be prescribed.
- **11.** Workers should have the right and the duty at any workplace to participate in ensuring safe working conditions to the extent of their control over the equipment and methods of work and to express views on the working procedures adopted as they may affect safety and health.

#### Safety of Workplaces.

- **12. Housekeeping programmes should be established and implemented on construction sites which should include provision for:**
  - (a). The proper storage of materials and equipment;
  - (b). The removal of [waste](#) and debris at appropriate intervals.
- **13. Where workers cannot be protected against falls from heights by any other means:**
  - (a). Adequate safety nets or safety sheets should be erected and maintained; or
  - (b). Adequate safety harnesses should be provided and used.
- **14.** The employer should provide the workers with the appropriate means to enable them to use individual protective equipment and should ensure its proper use. Protective equipment and protective clothing should comply with standards set by the competent authority, taking into account as far as possible ergonomic principles.
- **15.**
  - (1). The safety of construction machinery and equipment should be examined and tested by type or individually, as appropriate, by a competent person.
  - (2). National laws and regulations should take into consideration the fact that occupational diseases may be caused by machinery, apparatus and systems which do not take account

of ergonomic principles in their design.

### Scaffolds.

- **16.** Every scaffold and part thereof should be of suitable and sound material and of adequate size and strength for the purpose for which it is used and be maintained in a proper condition.
- **17.** Every scaffold should be properly designed, erected and maintained so as to prevent collapse or accidental displacement when properly used.
- **18.** The working platforms, gangways and stairways of scaffolds should be of such dimensions and so constructed and guarded as to protect persons against falling or being endangered by falling objects.
- **19.** No scaffold should be overloaded or otherwise misused.
- **20.** A scaffold should not be erected, substantially altered or dismantled except by or under the supervision of a competent person.
- **21. Scaffolds as prescribed by national laws or regulations should be inspected, and the results recorded, by a competent person:**
  - (a). Before being taken into use;
  - (b). At periodic intervals thereafter;
  - (c). After any alteration, interruption in use, exposure to weather or seismic conditions or any other occurrence likely to have affected their strength or stability.

### Lifting Appliances and Lifting Gear.

- **22. National laws or regulations should prescribe the lifting appliances and items of lifting gear which should be examined and tested by a competent person:**
  - (a). Before being taken into use for the first time;
  - (b). After erection on a site;
  - (c). Subsequently at intervals prescribed by such national laws or regulations;
  - (d). After any substantial alteration or repair.
- **23.** The results of the examinations and tests of lifting appliances and items of lifting gear carried out in pursuance of **Paragraph 22** above should be recorded and, as required, made available to the competent authority and to employers and workers or their representatives.
- **24.** Every lifting appliance having a single safe working load and every item of lifting gear should be clearly marked with its maximum safe working load.
- **25.** Every lifting appliance having a variable safe working load should be fitted with effective means to indicate clearly to the driver each maximum safe working load and the conditions under which it is applicable.
- **26.** A lifting appliance or item of lifting gear should not be loaded beyond its safe working load or loads, except for testing purposes as specified by and under the direction of a competent person.
- **27.** Every lifting appliance and every item of lifting gear should be properly installed so as, *inter alia*, to provide safe clearance between any moving part and fixed objects, and to ensure the stability of the appliance.
- **28.** Where necessary to guard against danger, no lifting appliance should be used without the provision of suitable signalling arrangements or devices.
- **29.** The drivers and operators of such lifting appliances as are prescribed by national laws or regulations should be
  - (a). Of a prescribed minimum age;
  - (b). Properly trained and qualified.

### Transport, Earth-moving and Materials-handling Equipment.

- **30.** The drivers and operators of vehicles and of earth-moving or materials-handling equipment should be persons trained and tested as required by national laws or regulations.
- **31.** Adequate signalling or other control arrangements or devices should be provided to guard against danger from the movement of vehicles and earth-moving or materials-handling equipment. Special safety precautions should be taken for vehicles and equipment when manoeuvring

backwards.

- **32.** Preventative measures should be taken to avoid the fall of vehicles and earth-moving and materials-handling equipment into excavations or into water.
- **33.** Where appropriate, earth-moving and materials-handling equipment should be fitted with structures designed to protect the operator from being crushed should the machine overturn, and from falling material.

### **Excavations, Shafts, Earthworks, Underground Works and Tunnels.**

- **34.** Shoring or other support for any part of an excavation, shaft, earthworks, underground works or tunnel should not be erected, altered or dismantled except under the supervision of a competent person.
- **35.**
  - (1). Every part of an excavation, shaft, earthworks, underground works and tunnel where persons are employed should be inspected by a competent person at the times and in the cases prescribed by national laws or regulations, and the results recorded.
  - (2). Work should not be commenced therein until after such an inspection.

### **Work in Compressed Air.**

- **36.** The measures regarding work in compressed air prescribed pursuant to Article 21 of the Convention should include provisions regulating the conditions in which the work is to be carried out, the plant and equipment to be used, the medical supervision and control of workers and the duration of work in compressed air.
- **37.** A person should only be allowed to work in a caisson if it has been inspected by a competent person within such preceding period as is prescribed by national laws or regulations; the results of the inspection should be recorded.

### **Pile Driving.**

- **38.** All pile-driving equipment should be of good design and construction taking into account as far as possible ergonomic principles, and properly maintained.
- **39.** Pile driving should be carried out only under the supervision of a competent person.

### **Work Over Water.**

- **40. The provisions regarding work over water prescribed in pursuance of Article 23 of the Convention should include, where appropriate, the provision and use of suitable and adequate:**
  - (a). Fencing, safety nets and safety harnesses;
  - (b). Life vests, life preservers, manned boats (motor driven if necessary) and lifebuoys;
  - (c). Protection against such hazards as reptiles and other animals.

### **Health Hazards.**

- **41.**
  - (1). An information system should be set up by the competent authority, using the results of international scientific research, to provide information for architects, contractors, employers and workers' representatives on the health risks associated with hazardous substances used in the construction industry.
  - (2). Manufacturers and dealers in products used in the construction industry should provide with the products information on any health risks associated with them and on the precautions to be taken.
  - (3). In the use of materials that contain hazardous substances and in the removal and disposal of waste, the health of workers and of the public and the preservation of the environment should be safeguarded as prescribed by national laws and regulations.



- (4). Dangerous substances should be clearly marked and provided with a label giving their relevant characteristics and instructions on their use. They should be handled under conditions prescribed by national laws and regulations or by the competent authority.
- (5). The competent authority should determine which hazardous substances should be prohibited from use in the construction industry.
- **42.** The competent authority should keep records of monitoring of the working environment and assessment of workers' health for a period prescribed by national laws and regulations.
- **43.** The manual lifting of excessive weights which presents a safety and health risk to workers should be avoided by reducing the weight, by the use of mechanical devices or by other means.
- **44.** Whenever new products, equipment and working methods are introduced, special attention should be paid to informing and training workers with respect to their implications for safety and health.

### **Dangerous Atmospheres.**

- **45.** The measures regarding dangerous atmospheres prescribed pursuant to Article 28, paragraph 3, of the Convention should include prior written authority or permission from a competent person, or any other system by which entry into any area in which a dangerous atmosphere may be present can be effected only after completing specified procedures.

### **Fire Precautions.**

- **46.** Where necessary to guard against danger, workers should be suitably trained in the action to be taken in the event of fire, including the use of [means of escape](#).
- **47.** Where appropriate, suitable visual signs should be provided to indicate clearly the directions of escape in case of fire.

### **Radiation Hazards.**

- **48.** Stringent safety regulations should be drawn up and enforced by the competent authority with respect to construction workers engaged in the maintenance, renovation, demolition or dismantling of any buildings in which there is a risk of exposure to ionising radiations, in particular in the nuclear power industry.

### **[First Aid.](#)**

- **49.** The manner in which first-aid facilities and personnel are to be provided in pursuance of **Article 31** of the Convention should be prescribed by national laws or regulations drawn up after consulting the competent health authority and the most representative organisations of employers and workers concerned.
- **50.** Where the work involves risk of drowning, asphyxiation or electric shock, first-aid personnel should be proficient in the use of resuscitation and other life-saving techniques and in rescue procedures.

### **Welfare.**

- **51.** In appropriate cases, depending on the number of workers, the duration of the work and its location, adequate facilities for obtaining or preparing food and drink at or near a construction site should be provided, if they are not otherwise available.
- **52.** Suitable living accommodation should be made available for the workers at construction sites which are remote from their homes, where adequate transportation between the site and their homes or other suitable living accommodation is not available. Men and women workers should be provided with separate sanitary, washing and sleeping facilities.

### 1.5.8 - R175: Effects on Earlier Recommendations.

#### IV. Effect on Earlier Recommendations.

**53.** This Recommendation supersedes the Safety Provisions (Building) Recommendation, 1937 and the Co-operation in Accident Prevention (Building) Recommendation 1937.

#### Cross references.

- **Conventions:** C062 Safety Provisions (Building) Convention, 1937.
  - **Recommendations:** R053 Safety Provisions (Building) Recommendation, 1937.
  - **Recommendations:** R055 Co-operation in Accident Prevention (Building) Recommendation, 1937.
- **Conventions:** C115 Radiation Protection Convention, 1960.
  - **Recommendations:** R114 Radiation Protection Recommendation, 1960.
- **Conventions:** C119 Guarding of Machinery Convention, 1963.
  - **Recommendations:** R118 Guarding of Machinery Recommendation, 1963.
- **Conventions:** C127 Maximum Weight Convention, 1967.
  - **Recommendations:** R128 Maximum Weight Recommendation, 1967.
- **Conventions:** C139 Occupational [Cancer](#) Convention, 1974.
  - **Recommendations:** R147 Occupational Cancer Recommendation, 1974.
- **Conventions:** C148 Working Environment (Air [Pollution](#), Noise and Vibration) Convention, 1977.
  - **Recommendations:** R156 Working Environment (Air Pollution, Noise and Vibration) Recommendation, 1977.
- **Conventions:** C161 Occupational Safety and Health Convention, 1985.
  - **Recommendations:** R171 Occupational Health Services Recommendation, 1985.
- **Conventions:** C162 Asbestos Convention, 1986.
  - **Recommendations:** R172 Asbestos Recommendation, 1986.
- **Conventions:** C121 Employment Injuries Benefits Convention, 1964.
- **Conventions:** C167 Safety and Health in Construction Convention, 1988.
- **Conventions:** C155 Occupational Safety and Health Convention, 1981.
- **Conventions:** C164 Health Protection and Medical Care (Seafarers) Convention, 1987.

### 1.5.9 - Management controls for significant construction projects.

The **ILO Safety and Health in construction Convention C167** is reflected in the laws of many countries. For example, the UK's **Construction Design and Management Regulations 2007 (CDM)** set out the legal duties of those involved in construction work.

**These are called 'duty holders' and include:**

- The [client](#).
- The designer.
- The construction health and safety co-ordinator.
- Principal contractor.
- Contractors and the self employed.

### 1.5.10 - Client.

All those who work in the construction industry have their part to play looking after their own health and

safety and in improving the industry's health and safety record.

A CDM client is someone who is having construction or building work carried out, unless they are a domestic client. A domestic client is someone who lives, or will live, in the premises where the work is carried out. The premises must not relate to any trade, business or other undertaking. Although a domestic client does not have duties under CDM, those who work for them on construction projects will.

**On all projects clients will need to:**

- Check competence and resources of all appointees;
- Ensure there are suitable management arrangements for the project welfare facilities;
- Allow sufficient time and resources for all stages;
- Provide pre-construction information to designers and contractors.

**Where projects are notifiable under Construction (Design and Management) Regulations 2007, clients must also:**

- Appoint a CDM co-ordinator;
- Appoint a principal contractor;
- Make sure that construction work does not start unless a construction phase plan is in place and there are adequate welfare facilities on site;
- Provide information relating to the [health and safety file](#) to the CDM co-ordinator;
- Retain and provide access to the health and safety file.

#### **1.5.11 - Designer.**

On all projects, designers will need to ensure that any potential hazards and risks are eliminated, as far as is reasonably practicable, during the design process. They should also make sure that where it is not reasonably practicable to wholly eliminate a risk or hazard, sufficient information is provided about this to workers and others who may encounter the hazard.

When a project is of sufficient duration or value that the national health and safety authorities need to be notified, the designer also needs to check that the client is aware of their duties and that a project co-ordinator has been appointed. They should also co-operate in providing the necessary information for the project's health and safety file.

#### **1.5.12 - Construction health and safety co-ordinator.**

If a project exceeds a certain value or duration, the national health and safety authorities must be notified and in this case a co-ordinator is required.

**Their main duties are to:**

- Advise and assist the client with their duties;
- Notify details of the project to the national health and safety authorities;
- Co-ordinate health and safety aspects of design work and co-operate with others involved with the project;
- Facilitate good communication between the client, designers and contractors;
- Liaise with the principal contractor regarding ongoing design work;
- Identify, collect and pass on pre-construction information; and prepare/update the health and

safety file.

### 1.5.13 - Principal contractor.

A principal contractor is only required where the project is notifiable.

**The principal contractor needs to:**

- Plan, manage and monitor construction phase in liaison with contractor.
- Prepare, develop and implement a written plan and site rules (Initial plan completed before the construction phase begins).
- Give contractors relevant parts of the plan.
- Make sure suitable welfare facilities are provided from the start and maintained throughout the construction phase.
- Check competence of all appointees.
- Ensure all workers have site inductions and any further information and training needed for the work.
- Consult with the workers.
- Liaise with CDM co-ordinator regarding ongoing design.
- Secure the site.

### 1.5.14 - Contractors and the self employed.

On all projects, contractors will need to plan, manage and monitor their own work and that of their workers. They should verify that those who are working for them are competent for the work that they are carrying out.

Where a need for training has been identified to carry out and operate work procedures and equipment, it should be provided to ensure that no-one is lacking the necessary competencies to carry out the work required of them.

Contractors should pass on any information that they have or are given regarding risks to the health and safety of their workers. They should also make sure that their workers have access to adequate welfare facilities.

**On projects where the authorities need to be notified of developments, the contractor needs to:**

- Check that the client is aware of their duties;
- Check that a co-ordinator has been appointed and ensure that the national safety authority has been notified before the work starts;
- Co-operate with the principal contractor in planning and managing work, including reasonable directions and site rules;
- Provide details to the principal contractor of any contractor engaged in connection with carrying out work;
- Provide any information needed for the health and safety file;
- Inform the principal contractor of any problems with the plan;
- Inform the principal contractor of reportable accidents, diseases and dangerous occurrences.

### 1.5.15 - Workers.

It is not just the managers who have responsibilities when it comes to health and safety on site.

**Workers on construction sites should ensure that they contribute towards the safety of the contract by observing the following guidelines:**

- Not working outside their competency zone. A building site involves many different trades involved in varied tasks, all of which require a certain level of competency. In some cases, these tasks involve machinery which could be hazardous if used or operated by those who lack the expertise.
- Reporting obvious risks. A risk that is seen but not reported could injure or kill someone; workers must, in this aspect of construction be the eyes and ears of the health and safety manager on site. It should not be assumed that someone else will report it, nor should it be assumed that it is not the worker's concern.
- Co-operating with others and co-ordinate work so as to ensure their own health and safety and others who may be affected by the work. A wide variety of trades work alongside each other on every area of a construction site and unless there is effective communication between them all, the possibility of misunderstanding, lack of information and the consequent risk to safety increases. A well-managed site will include procedures for inter-trade communication and co-operation in its plan.
- Following site health and safety rules and procedures. The site procedures are should be laid down and made available for all workers to read and digest. As well as issuing rules in written format, sites may also display notices and signs to convey warnings and information. These rules and notices are vital for the safety of all workers on site and anyone who does not follow them may be subject to disciplinary action which could include removal from the site and the contract.

### 1.5.16 - Content of a pre-construction information pack.

The Pre-construction Information should contain information relevant to the nature of the project itself.

**Project description and programme details:**

- Anticipated dates (planned start and finishing dates of the construction phase).
- The minimum time to be allowed between appointment of the Principal Contractor and instructions to commence work on site.
- Details of client, designers, CDM Co-ordinator and other consultants.
- Whether or not the structure will be used as a workplace (in which case, the finished design will need to take account of the relevant requirements of the Workplace (Health, Safety and Welfare) Regulations 1992).
- Extent and location of existing records and plans.
- Planning for and managing the construction work, including any health and safety goals for the project.
- Communication and liaison between clients and others.
- Security of the site.
- Welfare provisions.
- Site hoarding requirements.
- Site transport arrangements and vehicle movement restrictions.
- The Client's permit-to-work arrangements.
- Fire precautions to be put in place.
- Emergency procedures and means of escape.



- Restricted areas or other authorisation requirements.
- Any areas the client has designated as confined spaces.
- Smoking and parking restrictions.

### **Environmental restrictions and existing on-site risks.**

#### **Safety hazards:**

- Boundaries and access, including temporary access, for example narrow streets, lack of parking, turning or storage space.
- Any restrictions on deliveries or waste collection or storage.
- Adjacent land uses, for example schools, railway lines or busy roads.
- Existing storage of hazardous materials.
- Location of existing services, water, electricity, gas, etc.
- Ground conditions, underground structures or water courses where this might affect the safe use of plant, for example cranes, or the safety of groundworks.
- Information about existing structures, stability, structural form, fragile or hazardous materials, anchorage points for fall arrest systems (particularly where demolition is involved).
- Previous structural modifications, including weakening or strengthening of the structure (particularly where demolition is involved).
- Fire damage, ground shrinkage, movement or poor maintenance which may have adversely affected the structure.
- Any difficulties relating to plant and equipment in the premises, such as overhead gantries whose height restricts access.
- Health and safety information contained in earlier design, construction or 'as-built' drawings, such as details of pre-stressed or post-tensioned structures.

#### **Health hazards:**

- Asbestos, including results of surveys (particularly where demolition is involved).
- Existing storage of hazardous materials.
- Contaminated land, including results of surveys.
- Existing structures containing hazardous materials.
- Health risks arising from client's activities.

#### **Significant design and construction hazards:**

- Significant design assumptions and suggested work methods, sequences or other control measures.
- Arrangements for co-ordination of ongoing design work and handling design changes.
- Information on significant risks identified during design.
- Materials requiring particular precautions.

**The health and safety file:** Description of the required format and any conditions relating to its content.

### **1.5.17 - The construction phase health and safety plan.**

#### **The General Framework for the Health and Safety Plan.**

Not all information relating to the project may be available to fully develop the health and safety plan before the start of construction. This could be because not all the design work may have been completed or many of the subcontractors who will be carrying out the work have yet to be appointed.

**However, site layout drawings covering the project at different stages, completed design**

**information and the pre-tender stage health and safety plan will be valuable in developing the health and safety plan so that:**

- The general framework is in place (including arrangements for welfare);
- It deals with the key tasks during the initial work packages where design is complete.

For projects where a significant amount of design work will be prepared as construction proceeds, specific arrangements for dealing with this work may need to be set out in the health and safety plan. This is important to ensure that the health and safety aspects of the design work are considered and dealt with properly by designers and the [CDM Coordinator](#). This will particularly occur under the various design and build and management contracting forms of procurement.

The health and safety plan will need to be added to, reviewed and updated as the project develops, further design work is completed, information from the subcontractors starting work becomes available, unforeseen circumstances or variations to planned circumstances arise, etc.

**The health and safety plan can usually open with:**

- A description of the project;
- A general statement of health and safety principles and objectives for the project;
- Information about restrictions which may affect the work (e.g. neighbouring buildings, utility services, vehicular and pedestrian traffic flows and restrictions from the work activities of the client).

**These can include:**

- **1 Management:**
  - The management structure and responsibilities of the various members of the project team, whether based at site or elsewhere.
  - Arrangements for the principal contractor to give directions and to co-ordinate other contractors.
- **2 Standard setting:**
  - The health and safety standards to which the project will be carried out. These may be set in terms of statutory requirements or higher standards that the client may require in particular circumstances.
- **3 Information for contractors.:**
  - Means for informing contractors about risks to their health and safety arising from the environment in which the project is to be carried out and the construction work itself.
- **4 Selection procedures.**

**The principal contractor has to make arrangements for ensuring that:**

- All contractors, the self-employed and designers to be appointed by the principal contractor are competent and will make adequate provision for health and safety;
  - Suppliers of materials to the principal contractor will provide adequate health and safety information to support their products;
  - Machinery and other plant supplied for common use will be properly selected, used and maintained; and that operator training will be provided.
- **5 Communications and co-operation:**
    - Means for communicating and passing information between the project team (including the client and any client's representatives) the designers, the CDM Coordinator, the principal contractor, other contractors, workers on site and others whose health and safety may be affected.
    - Arrangements for securing co-operation between contractors for health and safety purposes.
    - Arrangements for management meetings and initiatives by which the health and safety objectives of the project are to be achieved.
    - Arrangements for dealing with design work carried out during the construction phase,

ensuring it complies with the duties on designers (CDM regulation 13) and resultant information is passed to the appropriate person(s).

- **6 Activities with risks to health and safety.**

Arrangements need to be made for the identification and effective management of activities with risks to health and safety, by carrying out risk assessments, incorporating those prepared by other contractors and also safety method statements which result.

**These activities may be specific to a particular trade (e.g. false work) or to site-wide issues, and may include:**

- The storage and distribution of materials.
- The movement of vehicles on site, particularly as this affects pedestrian and vehicular safety.
- Control and disposal of waste.
- The provision and use of common means of access and places of work.
- The provision and use of common mechanical plant.
- The provision and use of temporary services (e.g. electricity).
- Temporary support structures (e.g. false work).
- Commissioning, including the use of permit-to-work systems.
- Protection from falling material.
- Exclusion of unauthorised people.

Control measures to deal with these should be clearly set out, including protection of members of the public.

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